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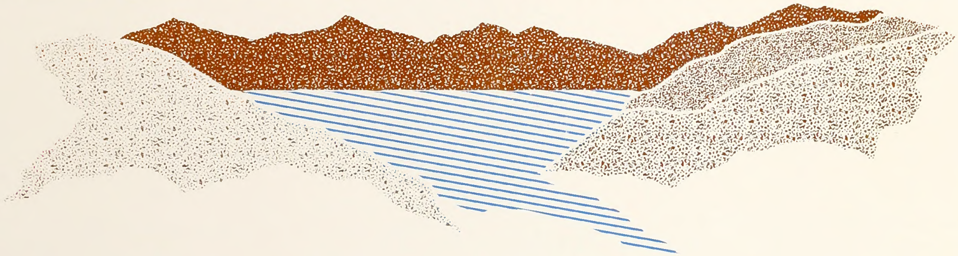
FINAL ENVIRONMENTAL IMPACT STATEMENT

Flood Control Master Plan

Clark County Regional Flood Control District

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT



April 1991

prepared for

United States Bureau of Land Management
Clark County Regional Flood Control District
Las Vegas, Nevada

in cooperation with

Department of the Army
Sacramento District Corps of Engineers

prepared by

DAMES & MOORE

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FINAL ENVIRONMENTAL IMPACT STATEMENT

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

FLOOD CONTROL MASTER PLAN

Prepared For:

Lead Agency

United States Bureau of Land Management
Stateline Resource Area, Las Vegas District
4765 Vegas Drive
Las Vegas, Nevada 89126

Cooperating Agency

Department of the Army
Sacramento District Corps of Engineers
650 Capital Mall
Sacramento, California 95814-4794

Clark County Regional Flood Control District
301 East Clark, Suite 300
Las Vegas, Nevada 89101

Prepared By:

Dames & Moore,
A Professional Limited Partnership
4220 So. Maryland Parkway
Las Vegas, Nevada 89119

Billy R. Templeton
Billy R. Templeton
State Director, Nevada

This Abbreviated Final Environmental Impact Statement (EIS), along with the Draft EIS, fulfills the Bureau of Land Management's requirements under the National Environmental Policy Act (NEPA). This EIS evaluates potential environmental impacts that may occur as a result of construction and operation of flood control facilities in the Las Vegas Valley, Clark County, Nevada. Potential impacts to sensitive resources were analyzed for the three major project alternatives. Two alternatives, the Detention/Conveyance and All Conveyance, were proposed in "Clark County Regional Flood Control District Flood Control Master Plan," prepared in 1986. Both alternatives were designed to provide a comprehensive, integrated, valley-wide plan to control 100-year flood flows, and both would meet project objectives. A third alternative, No Project, assumes that facilities will not be installed according to a comprehensive regional plan, but may continue to be built on a piecemeal basis by local entities and development interests. This alternative may not meet project objectives. The EIS presents a programmatic analysis of regional flood control plan alternatives including: 1) a summary of baseline data resources, 2) a procedure to identify sensitive resources, 3) potential impacts, and 4) appropriate mitigation-of-impact procedures. In addition to the region-wide analysis, this EIS includes the development of an analytical procedure to be applied to specific flood control projects to determine potential impact, need for additional environmental study, and appropriate mitigation measures. This procedure is intended to provide policy direction that can help facilitate the implementation of a regional flood control program in a manner consistent with NEPA. The project-specific analysis procedure was applied to the District's 10-year construction program, and site specific impacts and mitigation measures associated with each proposed facility are identified in this EIS.

For further information contact: Donn Siebert, Bureau of Land Management, Las Vegas District Office, P.O. Box 26569, Las Vegas, NV 89126 or telephone (702) 647-5000.

Table of Contents

INTRODUCTION I-1

SECTION 1 - COMMENTS RECEIVED ON THE DRAFT EIS 1-1

SECTION 2 - RESPONSES TO COMMENTS 2-1
  2.1 SUMMARY OF COMMENTS AND SPECIFIC RESPONSES 2-2
  2.2 TEXT REVISIONS 2-3
  2.3 FIGURE REVISIONS 2-4

SECTION 3 - BIOLOGICAL OPINION 3-1

INTRODUCTION

This Abbreviated Final Environmental Impact Statement is intended to be reviewed with the Draft Environmental Impact Statement (DEIS) for the Flood Control Master Plan, Clark County Regional Flood Control District, published in October 1990. The DEIS together with this addendum constitute the Final EIS for the proposed project.

Section 1 of this document contains complete copies of all comment letters received during the DEIS review. Assigned comment numbers are shown in the left margin of each letter.

Responses to comments are presented in Section 2. First, a table is provided which summarizes (by assigned number) the comments received and provides specific responses to those comments. Following the table, text and figure revisions made in response to comments are provided. Text revisions are highlighted by shading.

The Biological Opinion issued on this project by the US Fish and Wildlife Service is contained in Section 3.

SECTION 1 - COMMENTS RECEIVED ON THE DRAFT EIS

Comments received on the Draft EIS are provided in this section, as follows:

Letter No.	Commentator
1	National Park Service, Lake Mead National Recreation Area
2	USDI Fish and Wildlife Service, Reno
3	National Park Service, Western Region
4	U.S. Environmental Protection Agency, Region IX
5	Nevada State Clearinghouse, Department of Administration
5A	Nevada Department of Wildlife
5B	Nevada Division of State Lands
5C	Nevada Division of Historic Preservation and Archeology
5D	Nevada Division of Conservation Districts
5E	Nevada Division of Water Planning
5F	Nevada Division of Environmental Protection
6	Colorado River Commission of Nevada
7	Las Vegas Valley Water District
8	Department of the Army, South Pacific Division, Corps of Engineers
9	League of Women Voters of Nevada
10	USDI Bureau of Mines
11	USDI Bureau of Reclamation, Lower Colorado Regional Office
12	Clark County A-95 Clearinghouse Council

March 3, 1849

United States Department of the Interior

NATIONAL PARK SERVICE

LAKE MEAD NATIONAL RECREATION AREA
601 NEVADA HIGHWAY
BOULDER CITY, NEVADA 89005

RECEIVED
1990 NOV 27 AM 11:0
BUREAU OF
LAND MANAGEMENT

IN REPLY REFER TO:

L7621(LAME-R)

November 21, 1990

Memorandum

To: Stateline Area Manager, Bureau of Land Management

From: Superintendent, Lake Mead National Recreation Area

Subject: Draft Environmental Impact Statement

We have reviewed the Draft Environmental Impact Statement for the Clark County Regional Flood Control District Master Plan and find it very comprehensive. However, we do request that the following items be addressed in the assessment.

1.1 1. The Lake Mead National Recreation Area boundary should be shown on all maps and photographs that cover park lands even though the study area boundary may not cross the recreation boundary in all cases.

1.2 2. The proposed flood control devices for Boulder City show a lined channel that extends for approximately 3,000 feet onto park lands in the Hemenway wash. This channel should be shown to end before entering the park and should have some sort of energy dissipating device at its terminus to protect park lands from erosion downstream.

We appreciate the opportunity to comment on this assessment.

John A King
for

Alan O'Neill

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE ENHANCEMENT
RENO FIELD STATION
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

November 26, 1990
File No.: 1-5-91-TA-22

Memorandum

To: Stateline Area Manager, Las Vegas District, Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Reno Field Station, Reno, Nevada

Subject: Draft Environmental Impact Statement, Flood Control Master Plan, Clark County Regional Flood Control District, Clark County, Nevada

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced document dated October 1990. Our comments, which relate primarily to impacts of the project on biological resources of the Las Vegas Valley and proposed mitigation for these impacts, are provided below:

GENERAL COMMENTS

The draft Environmental Impact Statement (Statement) in general is adequate and thorough in its assessment of impacts of the project on fish and wildlife resources, including threatened, endangered, and candidate species. The recommendations for mitigation of project impacts are, for the most part, appropriate. We have several recommendations regarding various aspects of the document, primarily mitigation of impacts. These are provided under specific comments.

SPECIFIC COMMENTS

2.1 Executive Summary, Page ES-2. This section states in paragraph 3 that the Corps of Engineers (Corps), in a separate action, is preparing an environmental impact statement to construct flood control facilities on Flamingo and Tropicana Washes. The Statement should mention that the Corps' Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) project is the Corps version of a portion of the Clark County Regional Flood Control District (District) Master Plan.

2.2 Section 1.0 Introduction. Pages 1-1 to 1-6. We recommend that this section contain a summary of the authorizing actions, including direct approvals, permits, and licenses required from other agencies, that must be completed before the District's project can proceed. In this regard, the Bureau of Land Management (Bureau) has consulted with the Service under Section 7 of the Endangered Species Act of 1973 regarding endangered and threatened species issues. The Service will also comment on any public notice issued by the

Corps pursuant to Section 404 of the Clean Water Act for discharge of dredged or fill material into wetlands or waters of the United States. Consultation between the Bureau and the Service under the Fish and Wildlife Coordination Act (Act) may also be appropriate for this project. Under the Act, the Service has the authority to investigate and report on all proposals for work and/or other activities in or affecting waters of the United States that are sanctioned, permitted, assisted or conducted by the Federal government.

2.3 Section 8.1.1 Vegetation Types and Wildlife Habitats. Page 8-2. This section should mention the reconnaissance surveys referred to in other portions of the document as a source of information on wildlife species found in the project area.

2.4 Section 8.1.1.2 Herbaceous Wetland. Page 8-6. Paragraph 2 of this section states that persistent emergent wetland vegetation occurs along all the perennial water courses of the project area, including channelized washes within and downstream of urban areas of the Las Vegas Valley. These washes include Flamingo and Tropicana washes and Duck Creek. Figure 15-37, which maps sensitive biological resources in that portion of the Las Vegas Valley that includes these streams, does not show the herbaceous wetlands found within these water courses. The draft Coordination Act Report, prepared by the Service for the Corps' Las Vegas Wash and Tributaries Project, includes in an Appendix a discussion of these wetlands and their locations along Tropicana and Flamingo Washes as of June 1, 1989. We recommend that Figure 15-37 of the Statement show these wetlands and those found in and adjacent to Duck Creek.

2.5 Section 8.1.2.2 Sensitive Wildlife. Page 8-10. Paragraph 3 of this section mentions the Biological Opinion issued by the Service on August 28, 1990, for the District's 10-year Plan. We recommend that the Opinion be included in the Statement as an appendix.

2.6A Section 8.3.1.1 Botanical Resources -- Vegetation: Floodways. Page 8-18. This section states that impacts are expected to be limited to specific areas within the floodway and not represent wholesale clearing. It is our understanding that the area of the entire floodway and bordering dikes will be completely cleared, but allowed to revegetate following project completion. The Statement, however, implies that only portions of the floodways will be cleared. This issue should be clarified.

2.6B Construction of 50-foot-wide floodways in broad floodplains that contain desert riparian scrub vegetation may have long-term adverse effects on that vegetation. Because of the isolation of flood flows from portions of the floodplain outside of the floodway berms, riparian vegetation which previously depended on the unconfined water regime of the natural channel can be expected to decline in vigor and extent over time.

2.7 Section 8.3.1.1 Botanical Resources -- Vegetation: Detention Basins. Page 8-19. Paragraph 2 of this section states that disturbance of upland vegetation due to construction of detention basins is generally not considered significant due to the large amount of similar habitat in the study area. Because this vegetation provides habitat for a variety of sensitive wildlife species, including the threatened desert tortoise (Gopherus agassizii), we consider the impact significant.

2.8 Section 8.3.1.4 Wildlife Resources -- Sensitive Species. Pages 8-22 and 8-23. Although this section refers in one paragraph to the District's 10-year Plan, it is not clear whether figures given for loss of tortoise habitat and take of tortoises are for implementation of the 10-year Plan or for the overall Master Plan. This point should be clarified in the Final Statement.

2.9 Section 8.4 Environmental Effects by Alternative. Pages 8-29 to 8-32. Wetland and riparian habitats provide nesting and foraging habitat as well as cover for wildlife, particularly migratory birds, and are a valuable but declining resource in the arid west. We recommend that this section provide an estimate of the number of acres of these habitat types to be affected by the project.

2.10A Section 8.5.2. Mitigation Measures. Mitigation measures presented in the document may not be adequate to compensate for losses to wetlands and waters of the United States. It is the policy of the Service in Region 1, to view wetland degradation or losses as unacceptable changes to an important national resource. Accordingly, it is the goal of the Service to insure that no net loss (acreage or value, whichever is greater) of wetland habitats occurs. The Service will comment on any Corps public notice for a permit to discharge dredged or fill material into wetlands or waters of the United States pursuant to Section 404 of the Clean Water Act. Our primary goal will be avoidance of impacts. The District should evaluate alternative designs and implement those which are the least environmentally damaging practicable alternatives. We wish to work with the District to develop project designs that completely avoid or reduce impacts to wetlands to the greatest extent possible. If fill cannot be avoided, we will recommend full compensation for any losses or degradation which will occur. Appropriate compensation for wetland losses may include restoration or creation of wetlands at a ratio adequate to ensure no net loss of habitat acreage or values. Restored or created wetlands must be self-sustaining over the long term.

2.10B Waters of the United States include many intermittent washes in the Las Vegas area. Such washes may contain habitat of value to migratory birds, such as Mojave desert wash scrub vegetated with desert willow (Chilopsis linearis) and mesquite (Prosopis sp.). The Service will recommend compensation for losses to this habitat type as well as for any indirect impacts to wetlands and waters of the United States that may result from facility development. Our agency will request review of habitat creation and restoration plans developed for the project. Monitoring programs to ensure success of the compensation effort should be designed and implemented by the District. We recommend that the Statement reflect these Service goals.

2.10C The Statement lacks adequate information for a full understanding of how the Section 404 permit from the Corps may affect fish and wildlife resources. The information should include site-specific locations of facilities and design measures to minimize harm to biological resources. We are aware that these details will be developed during the design phase of project implementation. Accordingly, our comments do not preclude separate evaluation and comments by the Service when reviewing permit applications. The Service may concur, with or without stipulations, or recommend denial depending on affects. The Service advises that its tentative position, based on available information, would probably be to concur with issuance of permits for actions that constitute unavoidable impacts to wetlands and waters of the United States with stipulations for reducing and compensating for these impacts.

2.11 Section 8.5.4 Mitigation for Desert Tortoise. Pages 8-34 to 8-37. We recommend that this section state that additional mitigation measures and refinement of the measures presented in the Statement may be developed through Section 7 consultation with the Service for those portions of the project not addressed in the consultation on the 10-year Plan.

2.12 Table 8-2. Sensitive Wildlife Species in the Project Area. According to Dr. Ron Marlowe, suitable breeding habitat for the Arizona southwestern toad (Bufo microscaphus microscaphus) exists in Flamingo Wash in scattered locations downstream of Spanish Trail Country Club (Marlowe, pers. comm., 1989). This amphibian is a Category 2 candidate for Federal listing as an endangered or threatened species. Category 2 candidates include taxa for which information now in possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. We recommend that the species be listed in the table as possibly occurring in the project area, and that provisions be made for surveys for the toad in appropriate areas prior to project implementation.

2.13 Table 8-20. Summary of Programmatic Biological Mitigation Measures. The Service is supportive of the mitigation measures presented in the Statement and commends the District and the Bureau for their development and inclusion in the document. We have several additional measures that we recommend be included as follows:

1. Use cacti and yucca removed from facility sites in revegetation of temporarily disturbed areas where appropriate.
2. Delineate wetlands and waters of the United States in the project area early in the process and coordinate with the Corps and the Service to develop alternatives which avoid or reduce wetland impacts as well as compensate for wetland and other habitat losses that cannot be avoided.
3. Do not conduct-land clearing activities during the avian breeding season to avoid take of nests and nestlings. Such take would constitute a violation of the Federal Migratory Bird Treaty Act.

SUMMARY COMMENTS

We recommend that the Bureau incorporate the above suggested changes and additions into the Statement. We further recommend that the District work with our agency to develop site-specific designs to avoid impacts to wetlands and waters of the United States to the greatest extent possible and to develop measures to reduce and fully compensate for unavoidable impacts.

We appreciate the opportunity to review this draft Environmental Impact Statement. If you have any questions regarding our comments, please contact Mary Jo Elpers at FTS 470-5227 or (702) 784-5227.

David L. Harlow

cc: Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon (AFWE)
Fish and Wildlife Service, Branch of Federal Activities, Washington, D.C. (Attn: Dan Smalley)
Bureau of Land Management, Reno, Nevada
Clark County Regional Flood Control District, Las Vegas, Nevada
Nevada Department of Wildlife, Reno and Las Vegas, Nevada
U. S. Army Corps of Engineers, Los Angeles, California

March 3, 1849

United States Department of the Interior
NATIONAL PARK SERVICE
WESTERN REGION
450 GOLDEN GATE AVENUE, BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

RECEIVED
1990 DEC 10 11:
LAND MANAGEMENT

L7619(WR-RP)

December 6, 1990

Memorandum

To: Stateline Area Manager, Bureau of Land Management, Las Vegas, Nevada

From: Associate Regional Director, Resource Management and Planning, Western Region

Subject: Draft Environmental Impact Statement for the Clark County Regional Flood Control District Master Plan, **DES 90/0025**

3.1 We have reviewed the subject document and have the following comments. The Bureau of Land Management has developed an excellent management approach for addressing the cultural resources concerns and the compliance process in this document. The overview on the site types, chronology, data gaps, and previous surveys is clear, concise and complete. A major strength lies in the evaluations phrased in concert with the thematic contexts and planning goals of the archeological elements of the Nevada State Historic Preservation Plan.

3.2 Because of the extensive nature of the proposed flood control project, and the large number of known historic, prehistoric, and ethnographic resources within impact area alternatives, we recommend completion and implementation of the pending Programmatic Agreement (PA) for cultural resources with the Nevada State Historic Preservation Officer, the Advisory Council for Historic Preservation and the U.S. Army Corps of Engineers.

3.3 The Lake Mead National Recreation Area boundary should be shown on all maps and photographs that include park lands even though the study area may not include park lands.

3.4 The proposed flood control devices for Boulder City show a lined channel that extends for approximately 3,000 feet onto park lands in the Hemenway wash. This channel should be shown to end before entering the park and should have some sort of energy dissipating device at its terminus to protect park lands from erosion downstream.

cc:
Superintendent, Lake Mead National Recreation Area

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105

14 DEC 1990

Donn Siebert
Bureau of Land Management
Las Vegas District Office
P.O. Box 26569
Las Vegas, NV. 89126

Dear Mr. Siebert:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) titled **Flood Control Master Plan - Clark County Regional Flood Control District, Clark County, NV.** Our review is provided pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

The EIS presents a programmatic analysis of the following regional flood control plan alternatives: Detention/Conveyance (preferred alternative); All Conveyance; and No Project. The Detention/Conveyance and All Conveyance alternatives were designed to provide a comprehensive, integrated, valley-wide plan to control 100-year flood flows. The No Project alternative assumes that facilities will not be installed according to a comprehensive regional plan, but may continue to be built on a piecemeal basis by local entities and development interests. The Detention/Conveyance alternative is characterized by a series of detention basins which are designed to collect flood flows and release the flows at metered, reduced flow rates to downstream conveyance facilities. The All Conveyance system consists of a series of interrelated enlarged conveyance facilities (e.g., channels, floodways, dikes) designed to collect stormwater and convey it out of the area.

In addition to the region-wide analysis, the EIS includes the development of an analytical procedure to be applied to specific flood control projects to determine potential impact, need for additional environmental study, and appropriate mitigation measures. The project-specific analysis procedure is applied to the Clark County Regional Flood Control District's (CCRFCD) 10-year construction program, and site specific impacts and mitigation measures associated with each proposed facility are identified.

EPA commends the Bureau of Land Management (BLM) on their project-specific analysis procedure as described in Section 14 and the proposed mitigation measures for potential environmental impacts (e.g., Table 8-20 Summary of Programmatic Biological Mitigation Measures). We urge the BLM to continue their emphasis on avoidance of impacts and the use of project specific second-tier EISs to eliminate and minimize significant impacts.

Although EPA concurs with the analysis procedure and mitigation measures presented, we have questions regarding the relationship of the proposed program to Federal Emergency Management Agency (FEMA) requirements and concerns regarding E.O. 11988 Flood Plain Management requirements; future implementation of the analysis procedure and recommended mitigation measures; the cumulative impacts analysis; and cumulative impacts to air quality, water quality, and wetlands.

Based upon our review and the above concerns, we have classified this DEIS as category EC-2, Environmental Concerns - Insufficient Information (see attached "Summary of the EPA Rating System"). Our detailed comments are attached.

We appreciate the opportunity to review this DEIS. Please send three copies of the Final EIS to this office at the same time it is officially filed with our Washington, D.C. office. If you have any questions, please call Ms. Laura Fujii at (415) 744-1579, (FTS 484-1579).

Sincerely yours,

Deanna M. Wieman

Deanna M. Wieman, Director
Office of External Affairs

Enclosure: (5 pages)

EPA ID# 90-398
cc: COE, Sacramento District, Colonel Sadoff
    FWS, Reno Field Station, Reno, NV., Mary Jo Elpers
    NV. Division of Water Resources, Carson City, NV.
    NV. Dept. of Wildlife, Reno, NV.
    NV. Dept. of Env. Protection, Carson City, NV.
    NV. Dept. of Conservation and Natural Res., Carson City, NV.
    Clark Co. APCD, Las Vegas, NV.
    Clark Co. Reg. Flood Control District, Las Vegas, NV.
    DOI, San Francisco, Regional Env. Officer, Pat Port
    CEQ, Dinah Bear

GENERAL COMMENTS

4.1 1. The FEIS should address the relationship of the proposed flood control program to Federal Emergency Management Agency (FEMA) requirements. Describe whether Clark County is under a requirement to provide adequate flood protection in order to ensure FEMA level flood insurance rates. If 100-year flood protection levels can be demonstrated, local communities may be able to obtain lower FEMA flood insurance rates which may influence the pattern and rate of development.

4.2 2. The FEIS should describe the implementation and monitoring mechanisms which will be used to ensure future application of the project-specific analysis procedure and recommended mitigation measures as stated in the DEIS. Assurance of proper implementation of these measures is critical since the determination of insignificant impact is based upon the assumption that these measures will be implemented.

For instance, we recommend implementation of the regional meteorological data collection system, adoption of socioeconomic policy recommendations (pg. 11-16), and implementation of the biological mitigation measures (Table 8-20). The DEIS clearly states that these measures are required to provide necessary information to define actual extent of hydrological conditions (pg. 15-3), ensure validity of the programmatic approach (pg. 11-16), and to reduce impacts to a less than significant level (pg. 15-5).

4.3 3. The FEIS should address cumulative impacts associated with past, present, and reasonably foreseeable future actions (versus only proposed development) regardless of what agency or person undertakes such other actions, as required by NEPA (40 CFR Part 1508.7). For instance, we recommend full disclosure of the Corps of Engineers (COE) Las Vegas Wash and Tributaries Project and Clark County's Water Supply/Water Rights Permit program and their relationship to the proposed action. Address the potential for future linkage of these projects with Clark County Regional Flood Control District (CCRFCD) facilities.

4.4 4. EPA is concerned with cumulative impacts to air quality, water quality, and wetlands. As stated in Section 13, these impacts may be significant unless facility-specific mitigation is implemented. We recommend avoidance, minimization, and then mitigation of unavoidable impacts. BLM and CCRFCD should work closely with resources agencies (e.g., US Fish and Wildlife Service, Clark County Air Pollution Control Division (Clark County

APCD), COE Section 404 Regulatory Branch) to determine, avoid and minimize impacts of specific flood control projects to sensitive resources.

4.5 5. Executive Order 11988, Flood Plain Management requirements should be thoroughly addressed in the FEIS. E.O. 11988 directs Federal agencies to avoid long- and short-term adverse impacts associated with occupying and modifying flood plains. Federal agencies are also instructed to avoid direct or indirect support of flood plain development and to restore and preserve the natural and beneficial values served by flood plains.

4.6 6. The DEIS does not clearly demonstrate that the proposed project will not induce growth. Regional flood protection will free developers and local jurisdictions of providing costly flood protection facilities and may provide lower flood insurance rates which may influence the pattern and rate of development. In addition, early construction of upstream detention basins under the preferred alternative will provide a degree of flood protection in outlying undeveloped areas (pg. 13-5). Reliance on initial project policy and funding priorities (which can be changed) to favor accommodation of growth versus future development may not be sufficient to prevent induced growth.

EPA suggests the FEIS discuss the feasibility of drawing the affected communities into a binding local/Federal agreement to manage future development within proposed mitigation areas or within the existing (pre-project) 100-year flood plain.

4.7 7. EPA suggests the FEIS develop more specific mitigation measures for surface water and indirect impacts versus relying on future good engineering practices (pg. 7-18), Section 404 compliance (Table ES-1) or potential future environmental analysis.

4.8 8. We recommend the FEIS contain a summary of direct approvals, authorizing actions, licenses and permits required from other agencies that must be completed before the project can proceed. For example, the FEIS should contain more detailed information on COE Section 404 requirements and project compliance with the 404(b)(1) Guidelines.

4.9 9. We recommend the August 28, 1990 U.S. Fish and Wildlife Service Biological Opinion be attached as an appendix to the FEIS.

4.10 10. BLM may wish to consider distinguishing existing flood control facilities from proposed facilities on project diagrams. It may also be helpful to have an additional section containing all recommended mitigation measures.

SECTION 404 COMMENTS

EPA reviewed the proposed project for compliance with the Federal Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR 230) [hereafter referred to as the Guidelines], promulgated pursuant to Section 404(b)(1) of the Clean Water Act (CWA). To comply with the Guidelines, the proposed project and project-specific facilities must meet all of the following criteria:

- There is no practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem (40 CFR 230.10(a)).
- The proposed project does not violate State water quality standards, toxic effluent standards, or jeopardizes the continued existence of federally listed species or their critical habitat (40 CFR 230.10(b)).
- The proposed project will not cause or contribute to significant degradation of waters of the United States, including wetlands (40 CFR 230.10(c)). Significant degradation includes loss of fish and wildlife habitat, including cumulative losses.
- All appropriate and practicable steps are taken to minimize adverse impacts on the aquatic ecosystem (i.e., mitigation) (40 CFR 230.10(d)). This includes incorporation of all appropriate and practicable compensation measures for unavoidable losses to waters of the United States, including wetlands.

4.11 EPA recommends the project-specific analysis include a procedure to determine compliance with the 404(b)(1) Guidelines. Emphasis should be placed on the least environmentally damaging practicable alternative that meets the basic project purpose; and on avoidance, minimization and mitigation for only unavoidable impacts. The FEIS should clearly demonstrate that the basic project purpose for the proposed action is flood control versus other project purposes such as future development or water supply. Furthermore, the FEIS should fully address compliance of CCRFCD's 10-year Plan with the 404(b)(1) Guidelines. We suggest BLM and CCRFCD work closely with the Sacramento District COE.

Alternative Analysis

4.12 The FEIS should specify that the project-specific analysis should include a detailed alternatives analysis and the rationale for the selected preferred facility design, siting, and alignment. We recommend consideration of downsized or non-structural alternatives (e.g., flood easements) which may be available and practicable.

4.13 **Significant Degradation**

The FEIS should include maps that feature project areas occupied by wetlands, aquatic systems, and shrub/scrub riparian habitat. EPA believes a wetland delineation at the project-specific phase may be necessary to accurately determine the extent of jurisdictional wetlands in the project area.

4.14 **Mitigation**

EPA believes that mitigation sites should be secured and the mitigation plan completed prior to the start of any proposed construction. We recommend the mitigation plan include information on roles and responsibilities, estimated costs, and funding. Funding for proposed maintenance and monitoring activities needs to be identified and committed to ensure that necessary work will be funded. Without such a commitment, the success of the mitigation is put in question, and therefore project compliance with the Guidelines is questionable.

We recommend BLM and CCRFCD incorporate the following procedures into the mitigation program. Prior to project implementation, BLM and CCRFCD should consult with concerned resource agencies to develop performance standards that measure the success of mitigation plantings (e.g., plant survival, cover, density, diversity, and vigor), and remedial actions (e.g., replanting). We also recommend that BLM and CCRFCD consult with the concerned resource agencies when selecting a mitigation contractor.

Mitigation plots should be monitored annually for a predetermined period, and reporting requirements should be developed to convey this monitoring data to concerned agencies. At the end of this period, a determination should be made on whether the performance standards were met. If not, the project proponents should proceed with additional mitigation planning, planting, and monitoring until the mitigation requirements of success are met. In addition, mitigation sites should be protected from development, mowing, and pruning.

AIR QUALITY COMMENTS

The Clean Air Act (CAA) prohibits proceeding with any federal action that does not conform to the State Implementation Plan (SIP) for an area (42 U.S.C. Sec. 7506). The new Clean Air Act, further defines conformity to an Implementation Plan to mean activities will not "cause or contribute to any new violation of any standard in any area"; "increase the frequency or severity of any existing violation of any standard in any area"; or "delay timely attainment of any standard or any required interim emission reductions or other milestones in any area" (Section C(1)).

4.15 BLM, as a federal agency, is required to assure that conformity is upheld. Due to the potential high levels of projected CO and PM, it is very important BLM ensures conformity. The FEIS should address consistency of alternatives and CCRFCD's 10-year Plan with the policies, requirements, and provisions of the current regional Air Quality Plan and conformity requirements as described above.

4.16 Given the potential violations of CO and PM standards, we recommend the FEIS and Record of Decision (ROD) commit to the recommended mitigation measures (pg. 4-12 to 4-15) to offset increased air pollution and consider additional mitigation as necessary to ensure compliance with the CAA. The mitigation plan should address the effectiveness and implementation of the measures, the responsible agencies, funding, schedules and enforcement.

4.17 We further suggest that all relevant, reasonable mitigation measures outside the jurisdiction of BLM be explored in more detail as recommended by the Council on Environmental Quality (CEQ Memorandum: Questions and Answers about the NEPA Regulations, 1981, 19b). For example, we encourage BLM and CCRFCD to actively participate in regional air quality planning with Clark County APCD and to encourage in-filling of existing urban areas prior to developing outlying undeveloped areas.

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION*

Environmental Impact of the Action

LO—Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC—Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO—Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU—Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1—Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2—Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3—Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

BOB MILLER
Governor

STATE OF NEVADA

JUDY MATTEUCCI
Director

DEPARTMENT OF ADMINISTRATION
Capitol Complex
Carson City, Nevada 89710
Fax (702) 687-3983
(702) 687-4065

December 11, 1990

Runore Wycoff, Stateline area manager
Bureau of Land Management
4765 W. Las Vegas Drive
Las Vegas, Nevada 89126

Re: SAI NV # 91300042 Project: DEIS, Clark County Flood Control Masterplan

Dear Mr. Wycoff:

Attached are the comments from the Nevada Department of Wildlife and the Divisions of Stae Lands, Historic Preservation and Archaeology, Conservation Districts, Water Planning and Environmental Protection concerning the above referenced project. These comments constitute the State Clearinghouse review of this proposal as per Executive Order 12372. Please address these comments or concerns in your final decision.

Sincerely,

John B. Walker, Coordinator
State Clearinghouse/SPOC

JBW/gd
Enclosures

RECEIVED
DEC 10 1990
BUDGET DIRECTOR

Nevada State Clearinghouse

Department of Administration
Planning Division
Blasdel Bldg, Rm. 204
Carson City, Nv. 89710
687-4065

FROM: John B. Walker, Coordinator   DATE: October 18, 1990

TO:

____Governor's Office
____Agriculture
____Colorado River Cmsn.
____Communications Bd.
____Community Services
____Economic Development
____Fire Marshal
____Human Resources
____Aging Services
____Health Division
____Consumer Health

xxx Legislative Counsel Bureau
xxx ____Minerals
____ Nuclear Projects Ofc.
____ PSC
____ Tourism
xxx Transportation
____UNR Mines Bureau
____ UNR Library
____Wild Horse Commission
XXX ____Wildlife
xxx Emergency Management

Conservation-Natural Resources:
xxx Director's Office
xxx State Lands
xxx Environmental Protection
____ Forestry
xxx Historic Preservation
____ Conservation Districts
____ State Parks
____ Water Resources
xxx Water Planning

Nevada SAI #91300042   Project: DEIS, Clark Flood Control Master Plan

CLEARINGHOUSE NOTES:

Attached, for your review and comment, is a copy of the above mentioned project. Please evaluate it with respect to its effect on your plans and programs; the importance of its contribution to state and/or local areawide goals and objectives; and its accord with any applicable laws, orders or regulations with which you are familiar.

Please submit your comments no later than December 7, 1990. Use the box below for short comments. If significant comments are provided, please use agency letterhead and include the Nevada SAI number and comment due date for our reference.

THIS SECTION TO BE COMPLETED BY REVIEWING AGENCY:

____ No comment on this project
X Proposal supported as written
____ Additional information below

____ Conference desired (See below)
____ Conditional support (See below)
____ Disapproval (Explain below)

5A.1 AGENCY COMMENTS:
"All aspects of the proposed project as presented in Volumes I and II have been thoroughly addressed and are presented in a complete and accurate fashion from a Fish and Wildlife perspective. The DEIS represents one of the best examples of impact analysis, potential mitigation, and Section 7 consultation results that our agency has reviewed in quite some time. From a wildlife perspective, the document should be supported as written."

Robert P. McQuivey
HABITAT DIVISION CHIEF

Division of State Lands
State Land Office
State Land Use Planning Agency
~~(702) 687-4363~~

Address Reply to
Division of State Lands
Capitol Complex
Carson City, Nevada 89710

STATE OF NEVADA

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

Division of State Lands

December 6, 1990

MEMORANDUM

TO: John Walker, State Clearinghouse

FROM: Mike Del Grosso, Planner

SUBJECT: DEIS, CLARK FLOOD CONTROL MASTER PLAN
(NV SAI 91300042)

Enclosed are comments from various Divisions of the Department of Conservation and Natural Resources on subject proposal. Divisions included are Environmental Protection, Historic Preservation and Archaeology, Water Planning and Conservation Districts.

5B.1 The Division of State Lands has also reviewed the plan to determine if state-owned lands would be impacted. We have found that some state-owned properties, including those managed by the Division of State Parks, could be affected by flood control facilities and activities. Because of the scale and detail of the plan at this stage it is difficult to assess the actual affect or extent such facilities would have on state-owned lands, if any.

5B.2 As the system is implemented the direct impacts, if any, on state-owned lands can be better assessed. Wherever lands held by the Division of State Lands would be affected by project facilities or activities, appropriate permits, easements, etc., will have to be obtained from the Division.

We would like to point out that the preferred alternative, detention/conveyance alternative 2, appears to indicate a large detention/retention basin on land owned and managed by the State and the University of Nevada at Charleston Boulevard, west of Jones Boulevard. This property is being developed with a mental health complex and a community college facility and does not appear suitable for a detention/retention basin. The Flood Control District should contact this office and the University of Nevada on this.

JMD/kn

Enclosures

BOB MILLER
Governor

STATE OF NEVADA

RONALD M. JAMES
State Historic Preservation Officer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF HISTORIC PRESERVATION AND ARCHEOLOGY
123 W. Nye Lane, Room 208
Capitol Complex
Carson City, Nevada 89710
(702) 687-5138

November 26, 1990

MEMORANDUM

TO: John Walker, Department of Administration

THROUGH: Pam Wilcox, Administrator, State Lands

FROM: Alice M. Baldrica, Deputy SHPO Alice M Baldrica

SUBJECT: DEIS, Clark Flood Control Master Plan, NV SAI#91300042

5C.1 The Division has reviewed the draft environmental impact statement. In a general way, the DEIS indicates the steps that need to be taken to identify, evaluate and treat historic and cultural properties that are located within the area of potential effect. However, it does not identify specific properties within the area of effect, the effects to each site that will take place nor does it detail the procedures necessary for evaluation and treatment. At this time, it is impossible to make a determination of effect as defined in 36CFR800.

5C.2 For example, will Clark County or the Bureau of Land Management be responsible for hiring a consultant archeologist to conduct surveys? What agency will assume the responsibilities for surveys, data recovery, analysis, report writing and curation? Who will make determinations of effect? How far in advance of construction will inventories and data recovery take place? The project needs to be treated as a whole in a programmatic manner, not in pieces which would result in greater amounts of time and money expended with a lack of consistency in work performed.

5C.3 The Division strongly recommends that a programmatic agreement assigning procedures and responsibilities be drafted as soon as possible for incorporation into the final EIS. If you have any questions regarding the preparation of such a document or the process as a whole, please call me.

/AMB

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF CONSERVATION DISTRICTS
Capitol Complex
Carson City, Nevada 89710
Phone (702) 687-6977

November 30, 1990

MEMORANDUM

To: Pamela B. Wilcox, Administrator
Division of State Lands

From: Chris Freeman, Conservation District Program Specialist
Division of Conservation Districts

Subject: DEIS, CLARK FLOOD CONTROL MASTER PLAN (NV SAI #91300042)

5D.1 In reviewing NV SAI #91300042 it indicated a potential for 1,706 acres of land to be submerged in the event the detention ponds should fill with water. Will the flooding of these detention ponds have any impact on sensitive species?

CKF/cfw

BOB MILLER
Governor

STATE OF NEVADA

PETER G. MORROS
Director

EVERETT A. JESSE, P.E.
Administrator

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER PLANNING
Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710
(702) 687-3600

December 5, 1990

John Walker, Coordinator
Department of Administration
Planning Division
Blasdel Building, Room 204
Carson City, Nevada 89710

RE: Draft EIS, Clark County
Flood Control Master Plan,
Nevada SAI #91300042,
Due Date: December 7, 1990

Dear Mr. Walker:

We have reviewed the above referenced document and would like to compliment the authors on a well written document. Our comments are as follows:

5E.1 Section 7.4.2 Direct Operation

In the fourth paragraph of this section effects of the new flood control system upon storm water runoff quality are discussed. However, nothing is mentioned about reductions of existing natural biological treatment capabilities as a result of the removal and/or reduction of vegetation required for facility construction.

5E.2 Section 14.4 Ground Water

Item 2 in the second sentence of the first paragraph of this section should be changed to read "...2) Facility impacts associated with the reduction of discharge from the shallow aquifer." (Refer to Section 6.4 GENERAL ENVIRONMENTAL EFFECT, and Section 6.6. PROGRAMMATIC MITIGATION).

Sincerely,

Randy Pahl

Randall A. Pahl, P.E.
Hydraulic Engineer III

RAP:lr

BOB MILLER, *Governor*

STATE OF NEVADA

Administration (702) 687-4670
Air Quality 687-5065
Mining Regulation and Reclamation 687-4670
Waste Management (702) 687-5872

Water Permits and Compliance 687-4670
Water Quality Planning 687-4670
Wastewater Treatment Services 687-5870

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
123 W. Nye Lane
Carson City, Nevada 89710

November 27, 1990

CLEARINGHOUSE COMMENTS

SAI NV # 91300042

Due Date: November 30, 1990

Title: DEIS, Clark Flood Control Master Plan

AIR - Gay McCleary:

5F.1 Any air quality concerns are under the jurisdicition of the Clark County Health District.

MINING REGULATION AND RECLAMATION - Tom Fronapfel:

No comment.

WASTE MANAGEMENT - Colleen Cripps:

No comment.

WATER PERMITS AND COMPLIANCE - Dick Reavis:

No comment.

WATER QUALITY PLANNING - Glen Gentry/Icyl Mulligan:

5F.2 1.) Sedimentation/detention/retention/debris basins are desirable for slowing velocity of storm event (flash flood) runoff, and for capturing sediment and other pollutants that have the potential to both cause severe scouring and erosion, and to initiate impacts on water quality, wetlands, and associated downstream vegetation and habitat.

Maintenance of these and other structures or facilities is imperative in order to reduce or prevent impairment of floodwater/stormwater runoff quality. These basins are also desirable as they allow infiltration and recharge while slowing the passage of the runoff, which in turn allows downstream conveyances to better handle the storm flows.

5F.3 2.) Increased urbanization and development (especially in the western half of the valley) coupled with increasing areas of impervious surfaces which deliver greater volumes of runoff to the system, combine to create the potential for a.) larger amount of pollutants to be carried into the system; b.) accelerated erosion, and c.) possible water quality degradation downstream as pollutants can be carried faster and farther downstream through the conveyance system. Wetlands, vegetation and, habitat may be impacted or degraded by either upstream diversions (reducing available water), by less infiltration due to higher rates of runoff, or by increased flow rates and volumes of water delivered through more efficiently designed conveyance systems.

5F.4 3.) Revegetation and site stabilization during and after site disturbance and installation of facilities and structures is needed to prevent erosion and water quality degradation; also of concern is the use of herbicides on banks and channel bottoms and other sites within the area associated with the flood control project.

5F.5 4.) Of concern is the effect that lined or impervious surface conveyances will have on: a.) the shallow groundwater aquifer discharge that currently percolates or runs off into the existing drainages. If restricted, this discharge may possibly cause a rise in groundwater levels and or impact the underlying higher quality groundwater aquifer with the poorer quality (perched saline) shallow aquifer. b.) the urban runoff (nuisance water) would also be restricted in areas of the conveyance system where pipelines or concrete lined channels and or structures exist. The runoff waters could also contribute to a possible localized rise in the level of the shallow aquifer.

5F.6 Mechanisms to allow for both the handling of nuisance water (urban runoff) discharge and percolating shallow aquifer water should be seriously considered. Monitoring of the depth to the shallow aquifer (groundwater) level would be desirable to determine if there is a rise in groundwater due to any restrictions in discharges of these above mentioned waters.

BOB MILLER, *Governor*
JOHN T. MORAN, JR., *Chairman*
ROBERT L. CROWELL, *Vice Chairman*
JACK L. STONEHOCKER, *Director*

STATE OF NEVADA

THOMAS A. COWARD, *Member*
KAREN M. GALATZ, *Member*
GARTH R. WINCKLER, *Member*

COLORADO RIVER COMMISSION
OF NEVADA
1515 E. Tropicana, Suite 400
Las Vegas, Nevada 89158
(702) 486-7060
Fax: (702) 486-7064

RECEIVED
'90 DEC 19 [illegible] 7:0[illegible]
[illegible] AGEMENT

FAX TRANSMITTAL FORM

To: BUREAU OF LAND MANAGEMENT FAX: 647-5023

ATTN: Jerry Wickstrom,
Environmental Coordinator

From: GEORGE S. BLAKE

Material to be transmitted: Number of Pages: Cover + 5

Remarks: NOTE: COMMENTS FURNISHED BY GEO BLAKE, WATER RESOURCES ENGINEER, COLORADO RIVER COMMISSION OF NEVADA ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT MASTER PLAN.

THESE COMMENTS WERE NOT DISCUSSED WITH BOB COACHE, AND THE ONLY ONE DISCUSSED WITH NICK BRAYBROOK WAS THE CHANGE FROM 318 TO 360 GPCD ON PAGE 11-5. HE WAS IN AGREEMENT TO THE CHANGE AND SHOULD BE SHOWN AS THE REFERENCE.

Fax Numbers:

Send (702) 486-7064

Verify (702) 486-7060

To be filled in by Fax Operator:

Sent by: WANDA

Date: 12/19/90

Time:

Table 11-11 Revised

Water User	Acre Feet/1987
BASIC MANAGEMENT, INC.	
Industries	7,365
Henderson	3,932
Total deliveries	11,297
Losses	1,348
Total diversion	12,645
SOUTHERN NEVADA WATER SYSTEM	
Las Vegas Valley Water District	130,196
Nellis Air Force Base	1,340
North Las Vegas	13,217
Henderson	12,326
Total deliveries	157,079
Losses	3,863
Total diversion	160,942
LAS VEGAS VALLEY	
Deliveries to valley	168,376
Diversion from Lake Mead	173,587

6.1 Replace last sentence Section 6.1.6.3 with:

Southern Nevada has an allocation of 300,000 acre feet per year for consumptive use. Since credits are allowed for Colorado River water returned to Lake Mead, if returns amount to 180,000 acre feet per year, diversions would amount to 480,000 acre feet per year.

6.2 Replace first sentence Section 7.3.9 with:

In 1987, 174,000 acre feet was diverted from Lake Mead for use in the Las Vegas Valley and 86,000 acre feet was credited as return flow for a consumptive use of 88,000 acre feet.

6.3 Replace last 3 sentences of first paragraph of Section 11.1.7.3 with:

The Bureau of Reclamation in cooperation with the Colorado River Commission designed and developed the Robert D. B Griffith Water Project and the Colorado River Commission designed and developed the Alfred Merritt Smith Water Treatment Facility which together are known as the Southern Nevada Water System.
In 1987 approximately 157,000 acre-feet or 52% of the ultimate contractual quantity of 299,000 acre feet was used. That amount could be increased in the future so deliveries could be made in low demand (winter) months to provide water to recharge the aquifer for later recovery or recovery in high demand months.

shallow aquifer ground water could be used for irrigation in the central and eastern portions of the valley to assist in conserving potable water supplies currently used for irrigation and to reduce the rising shallow water table.

6.1.6.2 Near-Surface Reservoir

In 1976, Harrill reported that approximately five percent of the developed ground water in the Las Vegas Valley came from the near-surface reservoir. However, LVVWD indicated that the ground water in the near-surface reservoir is not used at present because of poor quality (Katzer, 1989).

6.1.6.3 Principal Aquifers

235,000

The total water use from all sources for Las Vegas Valley in 1987 was approximately ~~241,000~~ acre-feet ~~(Coache, 1987)~~. Approximately 28 percent or 67,000 acre-feet~~/year~~ of the public water supply for Las Vegas Valley was obtained from wells completed in the principal aquifer. The remaining 72 percent or ~~174,000~~ 168,000 acre-feet~~/year~~ was from surface water imports from the Colorado River via Lake Mead ~~(Coache, 1987). Until Southern Nevada uses its entire allocation of Colorado River water of approximately 299,000 acre-feet/year a reliance on ground water is projected to continue to decrease and the use of Lake Mead water will increase.~~ Insert

A breakdown of the 67,000 acre-feet/year of ground water produced in Las Vegas Valley during 1987 is described below. The North Las Vegas Well Field produced 5,635 acre-feet; the LVVWD Well Field produced 37,145 acre-feet; and the Nellis Air Force Base Well Field produced 1,855 acre-feet. An additional 22,643 acre-feet of ground water was estimated to be produced from all permitted and domestic wells in the valley.

6.2 SPECIFIC ENVIRONMENTAL CONDITIONS BY SUBAREA

This section contains a discussion of ground water in the valley by subareas. Specific parameters of concern to the proposed project are related to recharge and discharge to the shallow and primary aquifers.

6.2.1 Northern Las Vegas Valley Subarea

6.2.1.1 Hydrogeologic Units

The hydrogeologic units of the shallow, near-surface, and principal aquifer systems in the valley are similar to the units in other parts of the valley as described in Section 6.1.2.

6.2.1.2 Ground-Water Occurrence and Flow

Shallow Aquifers

The shallow aquifers in this subarea are projected to occur between Las Vegas Wash and the Frenchman-Sunrise Block (Cibor, 1983). Although the ground water in the Las Vegas Valley generally flows to the southeast, ground water in this subarea flows southwest towards Las Vegas Wash (Figure 6-1). Section 6.1.3.1 contains more details on the occurrence and flow of shallow ground water in the subarea.

Near-Surface Reservoir

The near-surface reservoir is present in the northern subarea from north of Tule Spring southeast to Nellis Air Force Base and south to Las Vegas Wash (Harrill, 1976). Flow direction is primarily to the southeast (see Section 6.1.3.2).

7.3.8 Perennial Low Flow Areas

Areas of perennial low flows and near surface flows under existing conditions are important as a biological and recreational resource. Changes in flow patterns or direct modification of these areas could adversely affect the biological and recreational resource values of these areas. The locations of these areas are further described in Section 8.3 of this EIS. Of particular importance is the Las Vegas Wash and some locations in the Tropicana Wash, Flamingo Wash, Duck Creek, Paradise Valley, Cottonwood Valley, and the Red Rock Canyon Wash.

7.3.9 Colorado River Return Flow Credit

Insert ~~The Las Vegas Valley obtains an average of 174,000 acre-feet per year of its water supply from Lake Mead.~~ Total Colorado River consumptive allocation to southern Nevada is ~~299,000~~ 300,000 acre-feet per year. The maintenance of adequate supplies given this allocation is in large part dependent on return-flow credits allowed for the return of water through Las Vegas Wash. Potential effects on WWTP operation, or changes in shallow groundwater levels in the Las Vegas Wash that reduce flows reaching Lake Mead could adversely affect the return flow credit, resulting in limitations on the Las Vegas Valley water supply. As described in Section 6.0, facility-related impacts on groundwater levels can be mitigated to less than significant levels.

7.4 FACILITY-RELATED ENVIRONMENTAL EFFECTS

The evaluation of the environmental impacts and effects of a flood control project which is still in the early design phases must be based upon certain key assumptions. Some of the most significant of these assumptions are that the project will be properly designed, constructed correctly and in the proper sequence, properly operated and will, in fact, do what it is designed to do. The engineering design of flood control facilities was the subject of the Master Plan (Montgomery Engineers, 1986), and is not repeated in this EIS. It is understood that preliminary and final design analysis will further refine the design of the proposed system and that, for any one wash or specific facility, some construction or operational changes may occur to improve the functional effectiveness of individual facilities and incorporate environmental mitigation measures. This analysis of the alternative flood control systems assumes that the principal design characteristics of each final in-place facility will not change significantly from the design currently proposed under each alternative. A summary of the general effects that may occur during facility construction or operation is presented in Table 7-8. These effects are discussed below.

7.4.1 Construction

Construction impacts could be significant especially if a storm occurs during the construction period. It is assumed that proper design and construction will minimize potential impacts to domestic water and sewage collection systems and to WWTPs. However, the possibility exists that construction activities may disrupt normal operation of these facilities. In this case there could be interruptions in service with a period of no domestic water supply or fire protection water in the vicinity of the construction site. An unplanned break in a sewer line would probably not be noticed by most users, but any raw sewage released at the construction site would pose a health hazard to persons at the site and in downstream areas. Construction damage to a WWTP is unlikely but could probably be handled by temporarily using another portion of the WWTP until repairs were completed. Damage to a WWTP could also result in a release of raw sewage, partially treated sewage, or sludge which would be a health hazard to persons at the site or in downstream areas.

Construction impacts to the storm water runoff, detention/retention basins and the storm water drainage facilities could include major modifications to the existing system and a variety of concepts

Building restrictions also apply to alluvial fans, which cover much of the western and northern portions of the valley and are subject to sheet flooding. For example, structures are required to be at least 18 inches above the 100-year surface water elevation and channels could be required to carry water into culverts and washes in the event of a flood.

11.1.7 Public Services

11.1.7.1 Police Protection

Police protection for Clark County is provided by four police departments: Las Vegas Metropolitan (Metro), Boulder City, Henderson, and the City of North Las Vegas. Las Vegas Metro provides service to the City of Las Vegas and the unincorporated areas of Clark County. Unincorporated rural areas are policed by Metro officers who are assigned to and live in a specified rural area. Table 11-8 provides information on each of the police departments.

The current rapid population growth is exerting pressure on existing police protection capacities. All of the police departments listed above, with the exception of Boulder City, are planning to expand their police forces by hiring more officers. Boulder City is not growing as rapidly as other jurisdictions in the Las Vegas area due to a growth moratorium. Funding for the police force expansions will be provided by recently approved tax increases. Developers are not assessed impact fees to help provide police services (Botkin, 1988; Ginser, 1988; Kinnee, 1988).

11.1.7.2 Fire Protection

Fire protection is provided by Clark County, Nellis Air Force Base, and the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City. The Clark County Fire Department serves the unincorporated urban and rural areas. Service in rural areas is provided by 16 stations operated by volunteer firefighters. Clark County Fire Department provides the stations and the equipment. The Clark County Fire Department has mutual aid agreements with Nellis Air Force Base and the cities of Las Vegas, North Las Vegas, and Henderson. When a fire occurs, the fire station nearest to the fire responds regardless of jurisdiction. Table 11-9 presents information on staff and equipment maintained by each fire department in the study area.

Ratings made by the Insurance Service Offices, a private organization which classifies urban areas for fire insurance purposes, rates fire departments on a scale of 1 to 10, with 1 being the best rating. The ratings of fire departments in the study are presented in Table 11-10. As this table indicates, fire department ratings in the Las Vegas Valley and Boulder City areas are generally very good.

Rapid population growth is exerting pressure on the departments' existing firefighting capabilities. Discussions with planners and fire department personnel indicate that sources of funding for expansion of capabilities, such as the construction of new fire stations near the new subdivisions, is now limited to tax increases and bond measures (Ginser, 1988; Kinnee, 1988; Mills, 1988; Price, 1988; Shoeburne, 1988). Currently, developers are not required to contribute to fire departments' expansions.

11.1.7.3 Water

The water sources for Clark County are Lake Mead and public and private wells. Most of the ~~W~~water from Lake Mead is provided through the Southern Nevada Water System ~~Project~~ which is jointly owned by the State of Nevada and the federal government. ~~The Bureau of Reclamation, in cooperation with the Colorado River Commission, designed and developed the Southern Nevada Water System to provide the ultimate delivery of 299,000 acre-feet per year to the Las Vegas Valley. In 1987, approximately 174,000 acre-feet per year or 58 percent of ultimate capacity are being used. The ultimate delivery~~

Insert

~~amount of 299,000 acre-feet could be increased in the future based on return flow credits to the Southern Nevada Water System (Braybrook, 1988)~~.

Contracting water users of the Southern Nevada Water System ~~Project~~ are the Las Vegas Valley Water District, Nellis Air Force Base, and the cities of North Las Vegas, Henderson, and Boulder City. Basic Management ~~Manufacturing~~ Inc. has a separate contract for water from Lake Mead. A breakdown of water currently delivered to the Las Vegas Valley from ~~the Southern Nevada Water Project~~ both systems is presented in Table 11-11.

Basic Management ~~Manufacturing~~ Inc. is an industrial park in Henderson; about 11,000 acre-feet of water was ~~its water is~~ used in the park's industrial facility and in the City of Henderson in 1987. The Las Vegas Valley Water District serves major portions of the City of Las Vegas and other unincorporated areas in the Las Vegas Valley. The City of North Las Vegas serves itself, a small part of the City of Las Vegas, and a portion of the unincorporated areas of Clark County.

The second source of water in the valley is a number of private wells which pumped approximately 67,000 acre-feet/year in 1987. The Las Vegas Valley Water District pumped approximately 37,154 acre-feet of this water in 1987. Other users are Nellis Air Force Base and the cities of North Las Vegas, Henderson, and Boulder City. Since 1945, groundwater withdrawals have exceeded recharge. This continued overdraft has resulted in a general lowering of the water table and surface settlement in some areas of the County.

The daily per capita use of water in the Las Vegas Valley area is approximately 360 ~~315~~ gallons (Braybrook, 1988).

11.1.7.4 Sewer

Collection

The incorporated cities in the Las Vegas Valley, as well as Nellis Air Force Base collect wastewater within their jurisdictions. Clark County Sanitation District collects wastewater in the majority of the serviced unincorporated area which is generally south of Sahara Avenue and east of Pecos Road (CCDCP, 1987). The City of Las Vegas collects wastewater from portions of the unincorporated areas north of Sahara Avenue and west of Highway 95, in addition to the incorporated area of the city.

Treatment

Individual treatment facilities are operated by the Clark County Sanitation District, and the cities of Las Vegas, Henderson, and Boulder City. Clark County Sanitation District treats wastewater from Nellis Air Force Base and services unincorporated portions of Clark County.

Clark County Sanitation District maintains three plants: a 40 million gallon capacity secondary plant, an 18 million gallon capacity headworks facility, and a 90 million gallon capacity Advanced Water Treatment Facility. The headworks facility screens and degrits wastewater, mixes it with secondary effluent from the secondary plant, then sends it to the County's Advanced Water Treatment Facility. Clark County currently processes approximately 41 million gallons of wastewater per day. Treated effluent is discharged into the Las Vegas Wash which flows into Lake Mead (Faulkner, 1988).

The City of Las Vegas has a 40 million gallon capacity secondary plant which is currently operating at full capacity. The City of Las Vegas' facility treats wastewater from both the cities of Las Vegas and North Las Vegas. A 25 million gallon capacity expansion is currently under way. Treated effluent is discharged into the Las Vegas Wash (Faulkner, 1988).

Las Vegas
Valley
Water
District

December 13, 1990

Bureau of Land Management
P.O. Box 26569
Las Vegas, NV 89126

Attention: Runore Wycoff, Stateline Area Manager

Gentlemen:

07 **SUBJECT: REVIEW OF "DRAFT ENVIRONMENTAL IMPACT STATEMENT" (DEIS) FOR THE CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT MASTER PLAN**

At your request we have reviewed the DEIS for the Clark County Regional Flood Control District Master Plan for any impacts on the Water District or on water resources in the Las Vegas Valley generally. We have no comments regarding the document at this time.

Sincerely,

David A. Donnelly, P.E.
Chief Engineer

DAD/SLR/mep

3700 WEST CHARLESTON BOULEVARD
LAS VEGAS, NEVADA 89153 • (702) 870-2011

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
630 Sansome Street, Room 720
San Francisco, California 94111-2206

REPLY TO
ATTENTION OF:

December 13, 1990

Directorate of Planning

Runore Wycoff, Stateline Area Manager
Bureau of Land Management
P.O. Box 26569
Las Vegas, NV 89126

Dear Mr. Wycoff:

This is in response to your request for comments on the Draft Environmental Impact Statement, Flood Control Master Plan, Clark County Regional Flood Control District.

We note that the EIS indicates that the document was prepared in cooperation of our Sacramento District Office. As you are aware, our Los Angeles District Office also has a keen interest in your activity because of its interrelationship to the Corps' Las Vegas Wash, Tropicana/Flamingo Washes, NV, feasibility investigations.

Our specific comments are listed below:

8.1 1. The Plans do not clearly indicate the locations of construction for each structure that may be placed in an area potentially subject to Section 404 jurisdiction. Also, the specifications should identify and delineate these areas, and the impact of each particular structure on its associated drainage.

8.2 2. In order for the Sacramento District to provide jurisdictional approval and for other State and Federal agencies to be able to evaluate the project with regard to their concerns, the drawings must include a plan sheet identifying the area of wetland, riparian scrub habitat or intermittent drainage each structure would impact. Identify the type of structure, the area of impact (sq. ft.), any associated fill (sq. ft.), i.e., "rip-rap", and the total area of impact (acres). The list should also be included in the specifications and should reference the plan sheet. Please note that all such areas will be subject to verification by our Sacramento District office. Any questions regarding Section 404 issues should be addressed to Kevin J. Roukey, Sacramento District Corps of Engineers, 650 Capitol Mall, Room 6524, Sacramento, California 95814-4794.

Phillip Frank Dunn

Phillip Frank Dunn
Director, Planning

LWV
THE LEAGUE
OF WOMEN VOTERS OF NEVADA

RECEIVED
1990 DEC 17 AM 11:05
LAND MANAGEMENT

December 14, 1990

Ms. Runore Wycoff, Stateline Area Manager
Bureau of Land Management
P. O. Box 26569
Las Vegas, NV 89126

Dear Runore:

I am forwarding a copy of the LEAGUE OF WOMEN VOTERS OF NEVADA comments relative to the Draft Environmental Impact Statement (DEIS) for the Clark County Regional Flood Control District Master Plan which were presented at the public hearing on November 28, 1990. I am doing this to assure that they are considered by the appropriate parties who are responsible for accomplishing the final DEIS.

9.1 We have another concern which is not noted in our comments and that relates to the possible impact of exporting floodwaters which might have historically entered acquifers which sustain the Desert National Wildlife Range at Corn Creek. We understand that tests of the deep carbonate acquifers in the Corn Creek area performed by the U. S. Geological Service found that the water travelled away from Las Vegas to the North. The tests were done to determine whether or not the acquifer might be a source for additional water for the Vegas Valley. Because flood waters coming off the Sheep Range will now be collected up and sent on to Lake Mead, environmental damage will undoubtedly occur. At a minimum, we believe subsidence in the North Las Vegas area will be increased. There are several detention basins planned for this area. We believe they should be converted to retention basins.

Sincerely yours,

Norma Cox

Norma Cox
PRESIDENT

Enclosure

NEVADA LEAGUE OF WOMEN VOTERS
Statement Concerning
Draft Environmental Impact Statement
For Clark County Regional Flood Control District Master Plan
Presented Nov. 28, 1990

Good evening. My name is Norma Cox, I live at 3096 E. Shadowridge, Las Vegas, Nevada, and I represent the League of Women Voters.

The League has long been involved as an active participant in finding solutions to the flooding problems in the Las Vegas Valley and has closely followed the development of the Clark County Regional Flood Control District Master Plan. Further, we have been heavily involved in the assuring that the proposed Desert Wetlands Park to be developed in the Las Vegas Wash becomes a reality. It is within this framework, that the following comments are offered.

9.2 1. We are very concerned that the impacts to the wetlands in the lower Las Vegas Wash have not been adequately addressed. The tables presented in Section 7 provide estimates of the 100-year, 3-hour design flows at key locations but do not address the cumulative effect of collecting flood waters from the some 1200-square mile Valley drainage area and sending the waters through the lower Las Vegas Wash and on to Lake Mead. We saw from the damage caused to the wetlands and structures in that area by the 1984 flood that tremendous amounts of water were being collected throughout the Valley and being sent out through the Wash. In fact, some 9 to 10 million dollars was spent on building a tunnel through which the pipeline bringing in the major portion of the Valley water supply could be run. This expenditure was caused by threatened exposure of the 15-foot deep pipeline which resulted from this flooding event. Wetlands are widely recognized throughout the world for their value, not only from the standpoint of providing wildlife habitat, but for their filtering abilities in cleaning polluted waters. In the past, our wetlands have played an important role in cleaning wastewaters being sent to Lake Mead. Clark County officials are now attempting solve the erosion problem in the lower Las Vegas Wash. The erosion problem worsens each year as more and more flood and wastewaters are sent through the wash. Stopping the erosion and re-establishing the wetlands will not be cheap and costs will only escalate as the volume and velocity of water passed through the wash increases.

9.3 2. We are also concerned that the draft gives little emphasis to the impact on water quality caused by increasing the amount of stormwater being sent to Lake Mead. We know that development of stormwater treatment standards are underway by the Federal

Environmental Protection Agency and we will be faced with additional clean-up costs when the standards are set in place. Flood waters which in the past were percolating through the ground to underground acquifers, will now be collected and sent through the Wash to Lake Mead. Section 6 of the draft which deals with ground water points out there that ground water in the near-surface reservoirs is of poor quality and has been degraded by infiltration of irrigation waters and surface runoff containing fertilizers, organics and other contaminants. Absorption of the stormwaters through the ground allows a natural filtering of contaminants but can only be accomplished where the soils are not saturated. The soils in the eastern and lower end of the Valley are heavily saturated for the most part. Adding water to these soils will result in pollutants being picked up or floated up and passed on to Lake Mead. Re-establishment of the wetlands can help in cleaning stormwaters, but not if they are washed out by increasing the amount of floodwaters sent to the area.

9.4 3. We are further concerned that the draft does not recognize the tremendous growth planned for the western and higher part of the Valley. For example, the peak flow into the Angel Park detention basin is shown as 7,210 cfs and at the Redrock detention basin it is shown to be 9,370 cfs. What will happen to these peak flows as Summerlin is built out? We, of the league, foresee that, with current flood control planning, increasing amounts of stormwater must be dealt with as they pass through the older developed areas of the Valley, on to Lake Mead. A system which collects stormwaters in the alluvial fans in the western part of the Valley and transports it on to Lake Mead can have very negative effects. It will limit recharge of principal acquifers, result in greater stormwater cleanup costs, and reduce the availability of rainwater to maintain tortoise habitat.

All of these concerns lead us to a conclusion which we have attempted to emphasize in a variety of situations. The conclusion is that we must plan a way to hold floodwater in the upper parts of the valley to the greatest extent feasible. When the League worked to support the development of a regional flood control master plan, it was with the thought in mind that retention basins would be part of the system. The draft points out that while the Angel Park basin was originally planned as a retention basin, current planning calls for it to be a detention basin. This means that there are no retention basins included in the plan. Retention basins will help us better manage our limited water supplies by harvesting floodwaters rather than shipping them on to downstream Colorado River users. But they will also control the floodwaters reaching the wetlands, thereby offering greater protection for this very important resource.

Thank you for your attention. I will be happy to answer any questions you might have regarding my statement.

United States Department of the Interior

BUREAU OF MINES

WESTERN FIELD OPERATIONS CENTER
EAST 360 3RD AVENUE
SPOKANE, WASHINGTON 99202-1413

TAKE PRIDE IN AMERICA

December 21, 1991

Memorandum

To: Runore Wycoff, Area Manager--Stateline Resource Area, Bureau of Land Management, Las Vegas, Nevada

From: Chief--Branch of Resource Evaluation

Subject: Clark County Regional Flood Control District Master Plan

10.1 We have reviewed the Draft Environmental Impact Statement (DEIS) for the subject plan and are extremely concerned about the poor assessment of impacts to sand and gravel resources in the Las Vegas Valley. Undeniably, Las Vegas is one of the fastest growing urban centers in the United States. This growth is dependent on an adequate supply of sand and gravel to support new construction. According to the BLM district geologist, available supplies are depleting to critical levels. Therefore, any threat to this resource constitutes a significant adverse impact to the Las Vegas community.

The Detention/Conveyance alternative would use existing sand and gravel quarries for some of the detention basins, regardless of the presence or absence of reserves. In case of the former, a loss of significant volumes of sand and gravel resources (p. 13-6) and reduced production of this resource (p. 5-24) would result. The loss of available sand and gravel combined with its increased use of this resource as construction material for the project will result in serious impacts on industry's ability to meet the ever-growing need for construction materials.

Further discussion with the district geologist indicates he was not informed
of plans to use existing quarries as detention basins, nor was he consulted
about the current sand and gravel situation in the area. Based on this and
10.2 statements made in the DEIS, we doubt if anyone knowledgeable about the
area's sand and gravel industry was consulted during preparation of the
document. Consequently, the DEIS incorrectly identifies the plan's impact as
insignificant. We believe this issue should have been listed under section
5.4 of the document as a significant resource requiring a separate
environmental analysis.

The final EIS should not be completed until this issue has been thoroughly
evaluated by your mineral staff. If the final can not be delayed, we
10.3 recommend the document be revised to state that only quarries with depleted
resources will be used as detention basins, and that all flood control
facilities will be relocated to avoid present and foreseeable mineral
extraction operations.

Thank you for the opportunity to provide input for this EIS. Should your staff have any questions or need assistance from the Bureau of Mines, please call Michael D. Dunn at FTS 439-2664 or (509) 353-2664.

Robert D. Weldin

United States Department of the Interior

BUREAU OF RECLAMATION
LOWER COLORADO REGIONAL OFFICE
P.O. BOX 427
BOULDER CITY, NEVADA 89005

IN REPLY
REFER TO:

LC-159
ENV-6.00

NOV 0 2 1990

Memorandum

To: Ms. Runore Wycoff, Stateline Area Manager, Bureau of Land Management, P.O. Box 26569, Las Vegas NV 89126

From: Regional Environmental Officer

11 Subject: Review of Draft Environmental Impact Statement (EIS) for the Clark County Regional Flood Control District Master Plan - (Your Letter of October 15, 1990) (Environmental Impact Statement)

We have reviewed the subject draft EIS and have no comments to offer.

Thank you for the opportunity to review the documents. We are returning them for your use.

William E. Rinne

Enclosures 2

CLARK COUNTY A-95 CLEARINGHOUSE COUNCIL
Clark County Bridger Building, Seventh Floor
225 Bridger Avenue • Las Vegas, Nevada 89155 • (702) 455-4181
COUNCIL MEMBERS: County of Clark • Boulder City • Henderson
Las Vegas • North Las Vegas

January 2, 1991

U.S. Department of the Interior
Bureau of Land Management
P.O. Box 26569
Las Vegas, Nevada 89126

Attention: Runore Wycoff,
Stateline Area Manager

12 DRAFT EIS FOR THE CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT MASTER PLAN - VOLUMES I & II

The Clark County Clearinghouse Council, at their January 2, 1991 meeting, accepted the above Draft Environmental Impact Statement.

We appreciate the opportunity to review this Draft EIS and look forward to your continued cooperation with the Clark County Clearinghouse Council.

Sincerely,

Theron H. Goynes

THERON H. GOYNES
Chairman

THG/hv

An Advisory Planning Council to the Participating Entities

SECTION 2 - RESPONSES TO COMMENTS

The following table summarizes the comments presented in Section 1, and provides specific responses to those comments. Text revisions made in response to comments are shown after the summary table, with revised portions highlighted. Figures revised in response to comments are provided at the end of this section.

2.1 SUMMARY OF COMMENTS AND SPECIFIC RESPONSES

#	Source	Comment/Questions	Response
01	NPS - Lake Mead NRA	1.1 The Lake Mead National Recreation Area boundary should be shown on all maps and photographs that cover park lands.	The Lake Mead NRA boundary is shown in this document on Figure A2-14(b). The boundary applies to the following maps in the Draft EIS also: • Figure 7-16, Intermittent and Perennial Flows (A2-14) • Figure 15-15, Known Potential Geologic Hazards/Constraints and Soils (A2-14) • Figure 15-29, Areas of Shallow Ground Water (A2-14) • Figure 15-43, Sensitive Biological Resources (A2-14) • Figure A1-14, City of Boulder City All Conveyance Alternative No. 1 • Figure A2-14, City of Boulder City Detention/Conveyance Alternative No. 2
		1.2 The proposed flood control devices for Boulder City should be shown to end before entering the park and should have some sort of energy dissipating device at its terminus.	A new Figure A2-14(b) has been included in Section 2 of this document, showing that the proposed flood control devices end at the Lake Mead NRA boundary and have an energy dissipating device. The new figure is from the recent update to the Boulder City Flood Control Master Plan (July 1990, Coe and Van Loo).
02	FWS - Reno Station	2.1 The Statement should mention that the Corps' Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) project is the Corps version of a portion of the Clark County Regional Flood Control District (District) Master Plan.	The Executive Summary was revised to incorporate a paragraph describing the Corps' current feasibility study (page ES-2). In addition, a new subsection 7.1.2.1 (COE Assistance on District Projects) was added to provide additional information on the Corps' proposed activities in the Flamingo and Tropicana Washes (page 7-2). Also, refer to the response to Comment #4.3.
		2.2 We recommend that this section contain a summary of the authorizing actions, including direct approvals, permits, and licenses required from other agencies....	Section 1 of the EIS has been revised (page 1-1) in response to the comment. Major authorizing actions include federal rights-of-way, consultation with U.S. Fish and Wildlife Service and the State Historic Preservation Office, 404 permits from the U.S. Army Corps of Engineers, and various project-specific construction permits and approvals.

#	Source	Comment/Questions	Response
		2.3 This section should mention the reconnaissance surveys referred to in other portions of the document....	Section 8.1.1, Vegetation Types and Wildlife Habitats, has been revised to include the site reconnaissance/characterization surveys as another source of information on wildlife distribution and vegetation types (page 8-2).
		2.4 We recommend that Figure 15-37 of the Statement show these wetlands and those found in and adjacent to Duck Creek.	Figure 15-27, Sensitive Biological Resources (A2-8), has been revised to show wetlands in and adjacent to Flamingo and Tropicana washes and Duck Creek. No facilities are expected to impact these wetland areas.
		2.5 We recommend that the Opinion be included in the Statement as an appendix.	The U.S. Fish and Wildlife Service Biological Opinion, dated August 29, 1990, along with amendments, is included in Section 3 of this document.
		2.6A Clarification is needed as to whether or not entire floodways and dike areas will be cleared of vegetation (page 8-18).	Floodways will be established by creating a 50-foot-wide pilot channel and constructing earthen berms on either side of that pilot channel. Vegetation within the pilot channel and berm areas would be cleared, but the majority of the vegetation within the floodway would not be cleared.
		2.6B Construction of floodways in broad floodplains that contain desert riparian scrub vegetation may have long-term adverse effects on that vegetation because of isolation of flood flows by berms.	Section 8.3.1.1 (page 8-19, Floodways) has been revised to acknowledge the potential for some riparian vegetation to become isolated by channel berms, and decline in vigor and extent. It is also noted that riparian vegetation recovery within the channel and along berms is expected to be enhanced due to concentration of water supply.
		2.7 Because this vegetation provides habitat for a variety of sensitive wildlife species, including the threatened desert tortoise (Gopherus agassizii), we consider the impact significant.	Upon reconsideration, it is agreed that disturbance of upland vegetation is significant; however, it is a fully mitigable impact. Text on page 8-19 has been revised to reflect this.

#	Source	Comment/Questions	Response
		2.8 It is not clear whether figures given for loss of tortoise habitat and take of tortoises are for implementation of the 10-year Plan or for the overall Master Plan. This point should be clarified in the Final Statement.	The figures provided for tortoise take and loss of habitat apply to the proposed 10-year Plan facilities. As stated in the revised text for Section 8.5.4 (Mitigation for Desert Tortoise, page 8-35), consideration of additional flood control facility projects beyond those specified in the 10-year Plan will require additional Section 7 consultation with the US Fish & Wildlife Service. Additional figures for tortoise take and loss of habitat will be developed through that consultation process.
		2.9 Provide an estimate of the number of acres of wetland and riparian habitat types to be affected by the project.	An estimate of acres disturbed has been added to page 8-29 for the two types of wetland vegetation in the project area. A total of 103.6 acres of desert wash scrub and 14.5 acres of desert marsh would be disturbed. Acres of wetland/riparian habitat disturbed are summarized in a new Table 8-19, included in this document.
		2.10A The District should evaluate alternative designs and implement those which are the least environmentally damaging practicable alternatives.	Specific mitigation measures will be implemented on a facility-by-facility basis using the guidelines identified in this programmatic document. In addition, the Corps of Engineers will provide input during the 404 permitting process to evaluate practicable alternative designs and the resulting impact on wetlands and waters of the U.S.
		2.10B Monitoring programs to ensure success of the compensation effort should be designed and implemented by the District. We recommend that the Statement reflect these Service goals.	Mitigation monitoring programs will be defined during the site-specific facility environmental analyses and will include consultation with affected agencies, such as the Corps of Engineers and Fish & Wildlife Service.
		2.10C The Statement lacks adequate information for a full understanding of how the Section 404 permit from the Corps may affect fish and wildlife resources. This information would include site-specific locations of facilities and design measures to minimize harm to biological resources.	The District is required to complete the 404 permitting process prior to receiving federal rights-of-way necessary before construction can begin. Site-specific evaluation of facilities will include analysis of impacts on biological resources, including wetlands and related impact analyses specified by the 404 permit conditions.

#	Source	Comment/Questions	Response
		2.11 We recommend that this section state that additional mitigation measures and refinement of the measures presented in the Statement may be developed through Section 7 consultation with the Service for those portions of the project not addressed in the consultation on the 10-year Plan.	Section 8.5.4, Mitigation for Desert Tortoise, has been revised to state that additional mitigation may be developed in consultation with U.S. Fish & Wildlife Service for portions of the project not included in the August 29, 1990 Biological Opinion (page 8-35).
		2.12 We recommend that the Arizona southwestern toad, a federal Category 2 species, be listed in the table of sensitive wildlife species as possibly occurring in the project area, and that provisions be made for surveys for the toad in appropriate areas prior to project implementation.	Table 8-2, Sensitive Wildlife Species in the Project Area, has been revised to include this species (Species No. 45 under Federal Candidate, BLM Sensitive, and/or State Protected Species).
		2.13 We have several additional measures that we recommend be included in the Summary of Programmatic Biological Mitigation Measures table.	The suggested mitigation measure of using cacti and yucca removed from facility sites in revegetation of temporarily disturbed areas has been added under Mitigation Designation D in Table 8-21 (was Table 8-20 in DEIS). Suggested measures to avoid take of nests and nestlings during avian breeding seasons were also added to Table 8-21 (Mitigation Designation N). Suggested mitigation to avoid or reduce wetland impacts and compensate for losses are already addressed in the DEIS and in Table 8-21 under Mitigation Designation F.
03	NPS - Western Region	3.1 The Bureau of Land Management has developed an excellent management approach for addressing the cultural resources concerns and the compliance process in this document.	No response required.
		3.2 We recommend completion and implementation of the pending Programmatic Agreement (PA) for cultural resources with the Nevada State Historic Preservation Officer, the Advisory Council for Historic Preservation and the U.S. Army Corps of Engineers.	A Programmatic Agreement (PA) was not written. A Class III cultural inventory will be conducted. Following completion of the Class III survey, the State Historic Preservation officer and, if significant properties would be affected, the Advisory Council on Historic Preservation will be consulted in accordance with 36 CFR 800. If any sites determined eligible for nomination to the National Register are found, mitigation or avoidance will be completed prior to approval of rights-of-way.

#	Source	Comment/Questions		Response
		3.3	The Lake Mead National Recreation Area boundary should be shown on all maps and photographs that include park lands.	See response to Comment #1.1. The boundary is shown in this document on Figure A2-14(b).
		3.4	The proposed flood control devices for Boulder City should be shown to end before entering the park and should have some sort of energy dissipating device at its terminus.	See response to Comment #1.2.
04	US EPA - Reg. IX	4.1	The FEIS should address the relationship of the proposed flood control program to Federal Emergency Management Agency (FEMA) requirements.	A new Sec. 7.1.4, Relationship to Floodplain Management, has been added (page 7-4) which addresses the relationship of the project to FEMA requirements. The District will ensure that proposed facilities will meet or exceed FEMA standards.
		4.2	The FEIS should describe the implementation and monitoring mechanisms which will be used to ensure future application of the project-specific analysis procedure and recommended mitigation measures as stated in the DEIS. We recommend implementation of the regional meteorological data collection system, adoption of socioeconomic policy recommendations (pg. 11-16), and implementation of the biological mitigation measures (Table 8-20).	The project-specific analysis procedure and programmatic mitigation measures specified in the EIS will be applied to the 10-year Plan facilities and to subsequent project facilities as they are identified. Proper implementation of these procedures and measures is essential to the overall goal of reducing project impacts below significant levels. The District will, in cooperation with the BLM and COE, administer the programmatic application of site-specific analyses and mitigation measures to ensure that all objectives are achieved. The District and BLM have agreed that the District will, as a condition of funding projects within an entity, require that entities comply specifically with both the letter and intent of the mitigation measures and stipulations identified in the Record of Decision. A draft interagency agreement addressing these requirements has been prepared, and is being circulated for review and approval by the affected entities. On those projects involving BLM permits and/or rights-of-way, BLM will maintain lead responsibility for site-specific NEPA and regulatory compliance.

#	Source	Comment/Questions	Response
		4.3 The FEIS should address cumulative impacts associated with past, present, and reasonably foreseeable future actions (versus only proposed development). We recommend full disclosure of the Corps of Engineers (COE) Las Vegas Wash and Tributaries Project and Clark County's Water Supply/Water Rights Permit program, and their relationship to the proposed project.	The cumulative effects discussion has been updated and revised to reflect all major actions in the study area for which data and specifications are reasonably available. This includes evaluation of past, current, and projected land development actions, development of the Apex Heavy Industrial Use Park, and other reasonably foreseeable actions. With regard to the potential for more intensive flood control projects whose feasibility is currently being studied by the Corps of Engineers, data are not currently available to permit evaluation of the Corps' specific projects. In addition, the Corps will be responsible for 404 permit actions involving the District's 10-year Plan and future facilities. For these reasons, the Corps is participating in the EIS process as a cooperating federal agency. Project-specific environmental analyses will be conducted by the Corps on all of their proposed projects tiering off the programmatic guidance defined through the current EIS. The Clark County Water Supply project is discussed in the revised Sec. 13.3.3, Ground Water (pages 13-6 and 13-7).
		4.4 EPA is concerned with cumulative impacts to air quality, water quality, and wetlands. We recommend avoidance, minimization, and then mitigation of unavoidable impacts. BLM and CCRFCD should work closely with resources agencies (e.g., US Fish and Wildlife Service, Clark County Air Pollution Control Division (Clark County APCD), COE Section 404 Regulatory Branch) to determine, avoid and minimize impacts to sensitive resources.	Both the District and BLM are committed to working closely with regional, state, and federal agencies to minimize the project-specific impacts associated with construction and operation of flood control facilities. The issues of concern to EPA (air and water quality, wetlands protection) are of particular concern to the residents and governing bodies within Clark County.

#	Source	Comment/Questions	Response
		4.4 (continued)	Air Quality - The Clark County Department of Comprehensive Planning is currently revising the air quality implementation plan for the Las Vegas Valley nonattainment area. This revision is being accomplished through extensive cooperation with all affected agencies and entities - including BLM and the District. The initiatives mandated in the Clean Air Act Amendments of 1990 will require more stringent measures to be adopted to obtain attainment status for the Valley, and these measures will include active participation by all major air pollutant sources, including those associated with construction-related particulate emissions. Water Quality - Water supply and quality issues are critical to the continued growth and prosperity of southern Nevada. The District's Master Plan is a vital component to protect the public and property, and it is being implemented in full cooperation with all affected entities and regulatory bodies, including the Nevada Division of Environmental Protection which oversees issues related to water quality within the State. In addition, the District and BLM are cooperating closely with the Corps of Engineers both through the Corps' 404 permitting process and the Corps' ongoing feasibility study related to potential future intensive flood control projects along the Tropicana and Flamingo Wash systems.

#	Source	Comment/Questions	Response
		4.4 (continued)	Wetlands - The District and BLM are interfacing closely with the Corps of Engineers (a cooperating federal agency), the U.S. Fish & Wildlife Service, and the Nevada Division of Environmental Protection to identify and analyze issues associated with stormwater discharge and its effects upon surface and groundwater and wetlands. In particular, the Corps' 404 permitting process addresses potential impacts to waters of the United States, which may include wetlands and intermittent watercourses. The District and BLM have already completed formal Sec. 7 consultation with the U.S. Fish & Wildlife Service regarding the threatened desert tortoise (Gopherus agassizii). This type of cooperation will continue on wetlands and related issues through the project-specific analysis procedure outlined in Section 14 of the EIS.
		4.5 Executive Order 11988, Flood Plain Management requirements should be thoroughly addressed in the FEIS.	See response to Comment 4.1. As discussed in the new Sec. 7.1.4 (page 7-4, Floodplain Management), BLM and the Corps of Engineers recognize their responsibility for providing leadership and action to reduce risks of flood loss and to minimize adverse impacts on human safety, health, and welfare. Implementation of the District's Master Plan will be a significant step toward achieving those objectives. Modification of the Valley's floodplain due to construction and operation of the proposed flood control facilities is expected to result in a substantial beneficial impact to the Valley as a whole.

#	Source	Comment/Questions	Response
		4.5 (continued)	Development has historically taken place (and is continuing to take place) in the Valley's floodplain. Protection of these developed areas is the primary motivation for implementation of the District's Master Plan. As a result, it is not anticipated that construction of the flood control facilities will promote or support further development within the remaining floodplain area. However, the area subject to flooding hazards will be reduced, resulting in beneficial cumulative impact. Executive Order 11988 also directs federal agencies to support restoration and preservation of the natural and beneficial values served by floodplains. This aspect of floodplain management is primarily associated with the wetlands currently existing in the Valley. Impacts to these resources are addressed in the responses to Comments 2.4, 2.6, 2.7, 2.9, 2.10, and 4.4.
		4.6 The DEIS does not clearly demonstrate that the proposed project will not induce growth. EPA suggests the FEIS discuss the feasibility of drawing the affected communities into a binding local/Federal agreement to manage future development within proposed mitigation areas or within the existing (pre-project) 100-year floodplain.	The issue of growth inducement is treated in the EIS from the standpoint that neither the implementation of the District's Master Plan nor the construction of the 10-year Plan facilities will induce growth per se in the Las Vegas Valley. The urgent need for flood control actions is driven by residential and commercial growth which has already taken place - even in the absence of such actions. It is not the District's intent to "open up" areas for development by providing flood control facilities but rather to provide a reasonable measure of protection for developments which are already in place, under construction, or approved. However, in view of the current and projected rates of growth in the Valley, it is reasonable to conclude that the District's future actions will be driven by development rather than being a driver for development.

#	Source	Comment/Questions	Response
		4.6 (continued)	Extensive development has occurred and is currently taking place in floodplain areas. Since the District is currently operating in a reactive mode, it is not in a position to greatly influence or manage future development. That responsibility lies with the Clark County Board of Commissioners and local municipalities and has not been made a part of the District's mission, which is the protection of lives and property. However, the District does coordinate closely with regional planning organizations, such as the Clark County Department of Comprehensive Planning, which do have the authority and responsibility for actions which influence growth. The BLM is currently preparing a Resource Management Plan (RMP) and is preparing a separate EIS which covers the impacts associated with the RMP. The BLM EIS is being prepared in close cooperation with all affected entities and will result in the development of federal land disposal policies which are consistent with NEPA.
		4.7 EPA suggests the FEIS develop more specific mitigation measures for surface water and indirect impacts versus relying on future good engineering practices (pg. 7-18), Section 404 compliance (Table ES-1) or potential future environmental analysis.	More specific mitigation measures will be identified and implemented on a project-specific basis in accordance with the programmatic guidance stipulated in the EIS. This will include the Corps' review of projects with regard to Section 404 compliance. For those facility-specific projects where the potential exists for significant adverse impacts, the District will perform a second-tier environmental analysis, as described in Section 14 of the EIS.
		4.8 We recommend the FEIS contain a summary of direct approvals, authorizing actions, licenses and permits required from other agencies that must be completed before the project can proceed.	See response to Comment #2.2.
		4.9 We recommend the August 28, 1990 U.S. Fish and Wildlife Service Biological Opinion be attached as an appendix to the FEIS.	The Biological Opinion is provided in Section 3 of this Addendum.

#	Source	Comment/Questions	Response
		4.10 BLM may wish to consider distinguishing existing flood control facilities from proposed facilities on project diagrams.	The description of 10-year Plan facilities provided in the EIS includes both existing and proposed structures. A complete description of all facilities is provided in the District's Flood Control Master Plan.
		4.11 EPA recommends the project-specific analysis include a procedure to determine compliance with the 404(b)(1) Guidelines. Furthermore, the FEIS should fully address compliance of CCRFCD's 10-year Plan with the 404(b)(1) Guidelines.	The Corps of Engineers, as a cooperating agency, will review all proposed facilities to evaluate compliance with Section 404(b)(1) of the Clean Water Act. The 404 permit review process will be part of the project-specific environmental analyses described in Section 14 of the EIS. Refer also to response to Comment #4.3.
		4.12 The FEIS should specify that the project-specific analysis should include a detailed alternatives analysis and the rationale for the selected preferred facility design, siting, and alignment.	As indicated in Section 14 of the EIS, project-specific analyses will be tiered from the programmatic approach described in the EIS, which includes analysis of practicable alternatives and development of site-specific mitigation measures.
		4.13 The FEIS should include maps that feature project areas occupied by wetlands, aquatic systems, and shrub/scrub riparian habitat.	See response to Comment #2.4. Jurisdictional wetlands were identified through consultation with the Corps of Engineers.
		4.14 EPA believes that mitigation sites should be secured and the mitigation plan completed prior to the start of any proposed construction. We recommend the mitigation plan include information on roles and responsibilities, estimated costs, and funding. We recommend BLM and CCRFCD incorporate the following procedures into the mitigation program. Prior to project implementation, BLM and CCRFCD should consult with concerned resource agencies to develop performance standards that measure the success of mitigation plantings and remedial actions. We also recommend that BLM and CCRFCD consult with the concerned resource agencies when selecting a mitigation contractor.	The project-specific analysis procedures identified in Section 14 of the EIS are designed to achieve these objectives on a site-specific basis. The District and BLM have already consulted with the Corps of Engineers, U.S. Fish & Wildlife Service, Nevada Department of Wildlife, and affected local agencies such as the Clark County Health District. This consultation will continue on a project-specific basis as flood control facilities are designed and scheduled for funding. Also, see response to Comment #4.2.

#	Source	Comment/Questions		Response
			Mitigation plots should be monitored annually and reporting requirements should be developed. A determination should be made on whether the performance standards were met. If not, the project proponents should proceed with additional mitigation planning, planting, and monitoring. Mitigation sites should be protected from development, mowing, and pruning.	
		4.15	The FEIS should address consistency of alternatives and CCRFCD's 10-year Plan with the policies, requirements, and provisions of the current regional Air Quality Plan.	As discussed in the response to Comment 4.4, the Clark County Department of Comprehensive Planning is currently revising the Air Quality Implementation Plan (AQIP) for the Las Vegas Valley to address attainment for CO, PM_{10}, and ozone standards. The project alternatives in the EIS were addressed from the standpoint of cumulative air quality conditions, and the District will comply with all provisions of the revised AQIP. This plan will mandate appropriate controls for sources of those pollutants which contribute to the nonattainment status of the Valley.
		4.16	We recommend the FEIS and Record of Decision (ROD) commit to the recommended mitigation measures (pg. 4-12 to 4-15) to offset increased air pollution and consider additional mitigation as necessary to ensure compliance with the CAA.	The FEIS and Record of Decision will commit the District and BLM to the programmatic mitigation measures specified in the EIS. Mitigation plans will be developed and implemented on a project-specific basis as facilities are designed and approved for funding.
		4.17	We further suggest that all relevant, reasonable mitigation measures outside the jurisdiction of BLM be explored in more detail. We encourage BLM and CCRFCD to actively participate in regional air quality planning with Clark County APCD and to encourage in-filling of existing urban areas prior to developing outlying undeveloped areas.	All relevant and reasonable mitigation measures will be considered on a project-specific basis. Also, see response to Comments #4.6 and 4.15.
05	Nevada State Clearing House			

#	Source	Comment/Questions		Response
05A	Nevada Department of Wildlife	5A.1	"From a wildlife perspective, the document should be supported as written."	No response required.
05B	Division of State Lands	5B.1	We have found that some state-owned properties, including those managed by the Division of State Parks, could be affected by flood control facilities and activities. Wherever lands held by the Division of State Lands would be affected by project facilities or activities, appropriate permits, easements, etc., will have to be obtained from the Division.	In the event state-owned lands will be affected by project-specific facilities, the District will coordinate with the Division of State Lands to obtain the appropriate permits, easements, or other approvals.
		5B.2	We would like to point out that the preferred alternative, detention / conveyance alternative 2, appears to indicate a large detention / retention basin on land owned and managed by the State and University of Nevada at Charleston Boulevard, west of Jones Boulevard. The Flood Control District should contact this office and the University of Nevada on this.	The District will coordinate with the Division of State Lands and the University of Nevada to determine whether Detention Basin CE-1B is in conflict with other intended uses at the site location. Also, see response to Comment #5B.1.
05C	Division of Historic Preservation & Archaeology	5C.1	The DEIS does not identify specific properties within the area of effect, the effects to each site that will take place nor does it detail the procedures necessary for evaluation and treatment.	The DEIS does indicate areas of potential sensitivity with regard to cultural and historic properties. A Class III survey will be conducted of the areas of potential effect (APE). Consultation on significance and effect will then be done, and mitigation or avoidance would be completed prior to approval of rights-of-way. Also, see response to Comment #3.2.

#	Source	Comment/Questions	Response
		5C.2 Will Clark County or the Bureau of Land Management be responsible for hiring a consultant archeologist to conduct surveys? What agency will assume the responsibilities for surveys, data recovery, analysis, report writing and curation? Who will make determinations of effect? How far in advance of construction will inventories and data recovery take place? The project needs to be treated as a whole in a programmatic manner.	The District will be responsible for hiring a consultant archeologist to conduct surveys and will be responsible for data recovery, analysis, report preparation, and resource curation. The District's selection will be subject to the concurrence of BLM and the SHPO. Determinations of effect will be made by BLM in consultation with SHPO. All site-specific treatment will be conducted in accordance with procedures established through Section 106 consultation.
		5C.3 The Division strongly recommends that a programmatic agreement assigning procedures and responsibilities be drafted as soon as possible for incorporation into the final EIS.	See response to Comment #3.2.
05D	Division of Conservation Districts	5D.1 The DEIS indicated a potential for 1,706 acres of land to be submerged in the event the detention ponds should fill with water. Will the flooding of these detention ponds have any impact on sensitive species?	See response to Comments #2.6, 2.7, and 2.9.
05E	Division of Water Planning	5E.1 In the fourth paragraph of Section 7.4.2, Direct Operation, effects of the new flood control system upon storm water runoff quality are discussed. However, nothing is mentioned about reductions of existing natural biological treatment capabilities as a result of the removal and/or reduction of vegetation required for facility construction.	See response to Comments 2.6 and 2.7.
		5E.2 Item 2 in the second sentence of the first paragraph of Section 14.4, Ground Water, should be changed to read "...2) Facility impacts associated with the reduction of discharge from the shallow aquifer."	Comment incorporated by revision to Sec. 14.4, page 14-4. The previous wording "discharge to the shallow aquifer" was corrected to read "discharge from the shallow aquifer."
05F	Division of Environmental Protection	5F.1 Any air quality concerns are under the jurisdiction of the Clark County Health District.	See response to Comment #4.4.

#	Source	Comment/Questions	Response
		5F.2 Sedimentation / detention / retention / debris basins are desirable for slowing velocity of storm event (flash flood) runoff, and for capturing sediment and other pollutants that have the potential to both cause severe scouring and erosion. Maintenance of these and other structures or facilities is imperative in order to reduce or prevent impairment of floodwater / stormwater runoff quality.	The District will maintain basins and other structures to ensure their effectiveness and to reduce or prevent impairment of floodwater / stormwater runoff quality.
		5F.3 Increased urbanization and development...coupled with increasing areas of impervious surfaces...combine to create the potential for a.) larger amount of pollutants to be carried into the system; b.) accelerated erosion, and c.) possible water quality degradation downstream.... Wetlands, vegetation and, habitat may be impacted or degraded by either upstream diversions (reducing available water), by less infiltration due to higher rates of runoff, or by increased flow rates and volumes of water delivered through more efficiently designed conveyance systems.	The primary objective of the District's Master Plan is to control and direct floodwater / stormwater flows which threaten life or property. The combination detention / conveyance alternative is designed to reduce storm event flow rates and manage the delivery of water to sensitive downstream areas such as the lower Las Vegas Wash. Wetlands, vegetation, and habitat values will be affected as intermittent washes are lined, reduced in size by channelization, or increased in capacity. These effects will be evaluated on a project-specific basis.
		5F.4 Revegetation and site stabilization during and after site disturbance and installation of facilities and structures is needed to prevent erosion and water quality degradation.	See response to Comment #2.6.
		5F.5 Of concern is the use of herbicides on banks and channel bottoms and other sites within the area associated with the flood control project.	See response to Comment #2.7.

#	Source	Comment/Questions	Response
		5F.6 Of concern is the effect that lined or impervious surface conveyances will have on: a.) the shallow groundwater aquifer discharge that currently percolates or runs off into the existing drainages. ...b.) the urban runoff (nuisance water). Mechanisms to allow for both the handling of nuisance water (urban runoff) discharge and percolating shallow aquifer water should be seriously considered.	In areas where shallow groundwater is present, weep holes or similar engineering features will allow discharge to existing drainages. Flood control facilities are typically designed for the 100-year event. Regional facilities provide the backbone for local drainages, including those for nuisance water.
06	Colorado River Commission	6.1 Replace last sentence Section 6.1.6.3 with: Southern Nevada has an allocation of 300,000 acre feet per year for consumptive use. Since credits are allowed for Colorado River water returned to Lake Mead, if returns amount to 180,000 acre feet per year, diversions would amount to 480,000 acre feet per year.	Section 6.1.6.3 has been revised with this sentence (page 6-7). Water use figures in this section have been updated from 1987 data to 1989 data.
		6.2 Replace first sentence Section 7.3.9 with: In 1987, 174,000 acre feet was diverted from Lake Mead for use in the Las Vegas Valley and 86,000 acre feet was credited as return flow for a consumptive use of 88,000 acre feet.	Section 7.3.9 has been revised to incorporate this sentence (page 7-18).

#	Source	Comment/Questions		Response
		6.3	Replace last 3 sentences of first paragraph of Section 11.1.7.3. with: The Bureau of Reclamation in cooperation with the Colorado River Commission designed and developed the Robert B. Griffith Water Project and the Colorado River Commission designed and developed the Alfred Merritt Smith Water Treatment Facility which together are known as the Southern Nevada Water System. In 1987 approximately 157,000 acre-feet or 52% of the ultimate contractual quantity of 299,000 acre feet was used. That amount could be increased in the future so deliveries could be made in low demand (winter) months to provide water to recharge the aquifer for later recovery or recovery in high demand months.	Section 11.1.7.3 has been revised as suggested (page 11-6).
07	Las Vegas Valley Water District		We have no comments at this time.	No response required.
08	Army Corps of Engineers (South Pacific Division)	8.1	The Plans do not clearly indicate the locations of construction for each structure that may be placed in an area potentially subject to Section 404 jurisdiction...and the impact of each particular structure on its associated drainage.	See responses to Comments #4.4 and 4.7.
		8.2	The drawings must include a plan sheet identifying the area of wetland, riparian scrub habitat or intermittent drainage each structure would impact.	See responses to Comments #2.4 and 2.9.

#	Source	Comment/Questions	Response
09	League of Women Voters	9.1 We have another concern...that relates to the possible impact of exporting floodwaters which might have historically entered aquifers which sustain the Desert National Wildlife Range at Corn Creek. There are several detention basins planned for this area. We believe they should be converted to retention basins.	Corn Creek Spring is located about 7 miles northwest of and about 400 feet higher in elevation than the northwesternmost flood control facilities in the Master Plan. Surface water drainage is to the southeast from the Corn Creek Spring area. We are unaware of any evidence to indicate that ground-water flow in either carbonate or alluvial aquifers is not also in a southeast direction in the area between the Spring and the flood control facilities. This is supported by the work of Harrill, et al. (1988) and Bedinger, et al. (1984), both of which report that ground-water flow is to the southeast from Corn Creek Spring. The flood control facilities are therefore located hydrologically downgradient and should have no impact on the systematics of Corn Creek Spring, regardless of the design of those facilities. Moreover, it is believed that the discharge at Corn Creek Spring is sustained primarily by snow melt in the mountains that has infiltrated to ground-water aquifers rather than by the infiltration of rain water during the summer (Harrill, 1991, oral communication). References: Harrill, J.R., et al, 1988, Major ground-water flow systems in the Great Basin Region of Nevada, Utah, and adjacent states: U.S. Geological Survey, Hydrologic Investigations Atlas HA-694C. Harrill, J.R., January 16, 1991, U.S. Geological Survey: oral communication. Bedinger, M.S., et al, 1984, Maps showing ground-water levels, springs, and depth to ground water, Basin and Range province, Nevada: U.S. Geological Survey, Water-Resources Investigations Rpt. 83-4119B.
		9.2 We are very concerned that the impacts to the wetlands in the lower Las Vegas Wash have not been adequately addressed.	See responses to Comments #2.4, 2.9, and 2.10.

#	Source	Comment/Questions	Response
		9.3 We are also concerned that the draft gives little emphasis to the impact on water quality caused by increasing the amount of stormwater being sent to Lake Mead.	See response to Comments #4.4, 5F.3.
		9.4 We are further concerned that the draft does not recognize the tremendous growth planned for the western and higher part of the Valley. What will happen to these peak flows as Summerlin is built out?	The District's Master Plan is designed to accommodate full buildout of the Summerlin project area.
10	U.S. Bureau of Mines	10.1 We are extremely concerned about the poor assessment of impacts to sand and gravel resources in the Las Vegas Valley. Any threat to this resource constitutes a significant adverse impact to the Las Vegas community.	The location and extent of sand and gravel resources is discussed in Sec. 5.1.6 and illustrated in Fig. 5-7. The potential impact upon existing gravel quarries is discussed in Sec. 5.5.1.7, and that section has been revised in response to this comment (page 5-23). In addition, Sec. 13.3.2 has been revised to address cumulative impacts on these resources (page 13-6).
		10.2 The DEIS incorrectly identifies the plan's impact as insignificant. We believe this issue should have been listed under section 5.4 of the document as a significant resource requiring a separate environmental analysis.	See response to Comment #10.1. In addition, Sections 5.5.2.1 (page 5-23) and 5.5.3.1 (page 5-24) have been revised with regard to direct and indirect impacts to mineral resources.
		10.3 We recommend the document be revised to state that only quarries with depleted resources will be used as detention basins, and that all flood control facilities will be relocated to avoid present and foreseeable mineral extraction operations.	Sec. 5.7.11 (page 5-29) has been revised in response to this comment. Also, Table 5-6 has been revised accordingly to include fair compensation for cost of relocating mineral resources.
11	USDI Bureau of Reclamation	We have no comments.	No response required.
12	Clark County Clearinghouse	The DEIS was accepted by the Council.	No response required.

2.2 TEXT REVISIONS

The principal objective of the Master Plan is to provide for the long-term improvement in public safety and property damage protection from flooding events by guiding the siting, design, and installation of flood control facilities to promote the effective function of the entire system. A secondary objective of the Master Plan is to identify the relative cost of different flood control options. Since cost-efficient systems are more readily implemented and hence more likely to accomplish the primary objective, relative cost of facilities is an important factor to be considered in the evaluation of the ability of a system or individual facility to accomplish the principal objective.

The US Army Corps of Engineers (COE), Los Angeles District, is evaluating the feasibility of designing and constructing flood control facilities along the Tropicana and Flamingo washes in the Las Vegas Valley. These future technical projects, if implemented by the Corps would constitute a more intensive variation to the types of facilities envisioned in the District's Master Plan. The Master Plan has been designed to accommodate more intensive future projects (such as those being evaluated by the Corps) and the impacts of any such projects would be evaluated at the time specific plans are proposed. These second-tier environmental analyses would be prepared by the Corps (or other project sponsors) in accordance with the project-specific guidance provided in Section 14 of this EIS.

PROJECT DESCRIPTION OVERVIEW

The EIS addresses three principal project alternatives, including the Detention/Conveyance alternative and All Conveyance alternative (both described in detail in the Master Plan), as well as the No Project alternative. In addition to this review of each overall program alternative, a specific analysis of the District's 10-year construction plan is presented in the EIS.

Flood Control Program Alternatives

The Detention/Conveyance system uses a series of detention basins to reduce peak flows to levels that can be accepted by the existing downstream conveyance system with little or no major capacity improvements (Montgomery Engineers, 1986). The general configuration and spatial location of the system is similar to the All Conveyance system but is characterized by a greater number of large detention basins which slow the release of water to a series of interrelated facilities including lined and unlined channels, reinforced concrete pipelines, conduits, and floodways.

The All Conveyance system is composed of a series of structures and facilities that are designed to collect stormwater and convey it out of the area. The key difference between this system and the Detention/Conveyance system is that flood flows are conveyed directly into larger lined and unlined channels, pipelines, conduits, and floodways without first reducing the rates of the flow.

Under the No Project Alternative, no flood control facilities would be built under the auspices of the District. Flood control facilities would continue to be built by individual cities, Clark County, and land developers without reference to an overall integrated system. Flood control facilities would be built on a piecemeal basis as local entities are able to allocate funds and new land developments occur. Under this alternative, flood episodes are likely to become more severe as urban growth continues, resulting in greater property damage and loss of life.

In 1986, the District adopted the Detention/Conveyance alternative over the All Conveyance alternative. The former was selected primarily on the basis of three major criteria: flexibility, reliability, and affordability, as set forth in the Master Plan. The Plan offered the greatest degree of flexibility, although it was not considered the most reliable for certain types of storm events. Based on the cost estimating tool developed by Montgomery Engineers (1986), the Detention/Conveyance alternative costs substantially

Section 1
INTRODUCTION

1.1 STUDY AUTHORITY AND OVERVIEW

This Environmental Impact Statement (EIS) was prepared for the United States Bureau of Land Management (BLM) to assess potential environmental effects of construction of flood control facilities in the Las Vegas Valley by the Clark County Regional Flood Control District ("District"). In 1985 the District contracted with a local engineering firm to evaluate existing flood related data, propose several alternative flood control systems, and recommend the most feasible approach to the District.

In 1986 the "Clark County Regional Flood Control District Flood Control Master Plan" was submitted to the District (Montgomery Engineers, 1986). Two major alternative flood control systems were proposed: 1) All Conveyance, and 2) Detention/Conveyance. Each of these alternatives consists of a series of interrelated facilities such as lined and unlined channels, detention and debris basins, dikes, box conduits, pipelines, and bridges. Although each system was of the same general configuration, the size and numbers of facilities varied between each alternative. Based on information presented in the Master Plan, the District adopted the Detention/Conveyance alternative as the preferred flood control system based on engineering and cost considerations.

Many of the facilities identified in the Master Plan are located on federal lands managed by the BLM. Before these facilities can be installed, BLM review and approval of right-of-way applications is required. On June 20, 1988 the BLM and the District entered into a Memorandum of Understanding (MOU) relating to applications for rights-of-way for flood control projects on federal lands administered by BLM. This MOU was accomplished under the authority of the Federal Land Policy and Management Act of 1976 (90 Stat. 273) as implemented by 43 CFR 2800. The MOU documents the responsibilities of the District and the BLM and establishes the BLM as lead agency for environmental review in accordance with the National Environmental Policy Act (NEPA). As lead federal agency, the Nevada State Office of the BLM determined that an Environmental Impact Statement should be prepared for the proposed District's rights-of-way. As a result, this EIS has been prepared to comply with provisions of NEPA and associated implementing regulations.

In addition to federal rights-of-way, the proposed facilities require numerous other authorizations, approvals, and permits from various entities. Major authorizing actions include Section 404 permitting through the US Corps of Engineers; Section 7 consultation under the Endangered Species Act with US Fish and Wildlife Service; and Section 106 consultation under the National Historic Preservation Act with the State Historic Preservation Office. Facility construction will also require various project-specific permits and approvals, such as soil disturbance permits and local construction permits (see Table 2-14).

1.2 NEED FOR AND OBJECTIVE OF ACTION

1.2.1 Regional Growth

Clark County makes up the southern tip of the state of Nevada, encompassing 7,910 square miles that are largely undeveloped. The bulk of Clark County urban development is within the Las Vegas Metropolitan area, which currently represents four percent of the surface land (Las Vegas Perspective 1988, Cooper et al., 1988). This metropolitan area is one of the fastest growing urban areas in the country, with growth occurring in previously undeveloped and rural areas.

Construction activities may induce wind erosion by disturbing surficial soils and increasing the quantity of airborne deposits or water erosion if a rainstorm occurred during construction. These potential impacts are significant, but mitigable as discussed in Section 5.7.

5.5.1.7 Mineral Resources

Five of the proposed flood control facilities (C-3, C-5, N-4, S-17, S-18) are located on or adjacent to existing gravel pits. BLM approval of construction activities to modify gravel pits on public lands for use as detention basins will require that permitted operators relinquish their use of the pits or, if incumbered with mining claims that the claimant relinquish his claim(s). With the exception of one Materials Site Right-of-Way located within the proposed S-18 detention basin, the impacted gravel pits are presently inactive and do not represent unique features or rare mineral resources that are not found elsewhere in the project area. Therefore, the loss of mineral resources due to construction activities is not considered to be a significant environmental impact. Relinquishment of mining claims could be promoted as discussed in Section 5.7.10.

5.5.1.8 Topographic Alteration

Construction activities for proposed flood control facilities may potentially affect the local geologic conditions. Topographic alteration, including excavation of debris and detention basins, construction of dikes/levees, and enlargement of existing channels and gravel pits, would be required for construction of the proposed facilities. However, no unique or special topographic features would be altered by the proposed project. Thus, impacts of construction on the local geology due to topographic modification are expected to be adverse, but insignificant.

5.5.2. Direct Operation

5.5.2.1 Mineral Resources

Five of the proposed flood control facilities are located on or adjacent to existing gravel pits, as discussed in Sec. 5.5.1.7. Use of these pits as detention facilities would preclude pit operations. With the exception of the Materials Site located within the proposed S-18 detention basin, the impacted pits are presently inactive and do not represent unique features or rare mineral resources that are not found elsewhere in the project area. The removal of these pits from use is therefore not expected to create a significant environmental impact. Fair compensation, as discussed in Section 5.7.11, to claimants and/or permittees will be required prior to the installation of facilities in these areas if claims cannot be declared null-and-void or if the claims can pass a validity examination and permits cannot be cancelled.

The gravel pits anticipated to be impacted are identified and illustrated with circles on a revised Fig. 5-7.

5.5.2.2 Erosion and Deposition

Many of the proposed detention structures are located at sites where deep excavations do not currently exist such as gravel quarries. Excavation of detention basins at these locations may potentially alter the baseline flow of surface water which could result in increased erosion or sedimentation upstream and/or downstream of the facilities. Facilities which decrease water velocity and/or increase sediment load may decrease erosion and increase sedimentation. An increase in velocity and/or decrease in sediment load can increase the erosive potential and decrease sedimentation in the areas where the change occurs.

5.5.2.3 Geologic Hazards and Constraints

Potential impacts associated with strong ground motion and surface fault rupture include damage to facilities not specifically designed and constructed to withstand such motion and displacement, and possible failure of detention facilities which could result in downstream flooding and damage to downstream properties if present. Potential impacts associated with slope instability, subsidence, collapsing soils, expansive soils, liquefaction, erosion and deposition, and corrosive soils include damage to facilities or structures not specifically designed and constructed to withstand the effects of these hazards and constraints. Accomplishment of proper engineering, including the incorporation of recommendations of a qualified engineering geologist following onsite inspection, is expected to reduce the potential impacts associated with these hazards to insignificant levels.

5.5.3 Indirect Operation

5.5.3.1 Mineral Resources

The installation of detention facilities and debris basins, in areas currently used as gravel pits, could result in the increased operation of other existing pit sites or require identification of new pits to meet the demand currently accommodated by the pits affected. The potential impact of this indirect effect is not expected to be significant in that all but one of the impacted pits are currently inactive.

The Materials Site Right-of-way located within the proposed S-18 detention basin represents an exlcusive right-to-use which was granted to the Nevada Department of Transportation (NDOT), and the materials withdrawn from this site can only be used for highway construction. Should the NDOT not relinquish its rights to use this site, the flood control basin will have to be relocated to avoid the site boundary.

5.5.3.2. Erosion and Deposition

Project operations could modify erosion and deposition patterns in off-site areas if sediment loads or flow velocities are modified in areas of discharge into unimproved channels or if facilities cause increased erosion or deposition upstream of these facilities. This is a particular concern with respect to discharges into the lower Las Vegas Wash, where existing erosion problems currently exist.

5.5.3.3 Slope Instability

Project operations could increase slope instability in off-site areas as a result of increased erosion associated with modified sediment loads and/or flow velocities at the base of existing unstable areas. This indirect effect could be particularly important if construction activities include disturbance of unstable areas without the application of appropriate erosion control and/or stability measures.

5.6 Environmental Effects by Alternative

A summary of geologic impacts, hazards, and constraints by alternative are presented in Table 5-3. Proposed flood control facilities for the All Conveyance and Detention/Conveyance alternatives are generally similar and differ primarily in size and capacity. As a result, both alternatives are expected to create similar impacts due to construction and operation of the proposed facilities.

5.6.1 Detention/Conveyance Alternative

As discussed in Section 5.5 potential environmental effects on the proposed project and/or resulting from the proposed project include strong ground motion, surface fault rupture, slope instability, subsidence, expansive soils, collapsing soils, liquefaction erosion and sedimentation, caliche, corrosive soils, topographic alteration, and reduced mineral resource production or establishment of new or expanded gravel pit operations.

Although most environmental effects are the same for the All Conveyance and Detention/Conveyance alternatives, several potential impacts related to the construction and operation of detention basins and levees/dikes are greater for the Detention/Conveyance alternative. Construction of the larger number of detention facilities may cause more topographic alteration than the All Conveyance alternative. Construction and operation of these facilities would require a reduction of mineral resource production at facility locations that are currently occupied by operating gravel pits or inactive pits with additional reserves. In addition, direct operation of detention facilities has a greater potential to alter baseline surface water flow and therefore potentially increase or decrease erosion and sedimentation upstream and downstream of the facilities in comparison to the All Conveyance alternative. In most cases erosion potential would likely be decreased by the Detention/Conveyance alternative as a result of lower flow velocities. Indirect impacts associated with scour and resulting slope instability near facilities discharges into natural channels could also be reduced by this alternative.

5.6.2 All Conveyance Alternative

As discussed in Section 5.5 potential environmental effects on the proposed project and/or resulting from the proposed project include strong ground motion, surface fault rupture, slope instability, subsidence, expansive soils, collapsing soils, liquefaction erosion and sedimentation, caliche, corrosive soils, topographic alteration, and reduced mineral resource production.

There is a potential for all of these environmental effects with All Conveyance alternative with the exception of reduced mineral resource production. Potential effects associated with caliche and topographic alteration are only likely during the construction phase and topographic alteration associated with modifications of channel morphology are considered to be minor.

5.6.3 No Project Alternative

The No Project alternative would not have any new impacts to the geologic environment beyond the existing impacts related to the current flood control facilities or lack thereof. Potential benefits of the flood control facilities (such as reduced scour and channel slope instability associated with Detention/Conveyance or All Conveyance discharges into natural channels) would also not occur.

5.7 PROGRAMMATIC MITIGATIONS

In general, mitigation of geologic impacts, hazards, and constraints can be accomplished by relocation, removal of the hazard or constraint if feasible, or by engineering design. During the evaluation process, if it is determined that relocation of the proposed facility is a superior and feasible alternative, the process should be implemented relative to an alternate location. The following procedure is recommended prior to construction of proposed flood control facilities

Information in this EIS should be reviewed during conceptual planning of proposed flood control facilities in order to identify geologic impacts, hazards, and constraints that are known to be present at or near a specific location. After review of the EIS, additional existing information should be collected and reviewed. This information could include more recent geologic data and reports, information obtained during investigation and construction of existing nearby flood control or other facilities and site-specific data such as geotechnical reports. The procedure outlined in Section 13.0 of this EIS should then be

Cathodic protection or protective coatings may be used to mitigate corrosion of steel in contact with corrosive soils.

5.7.11 Mineral Resources

Mitigation of loss of mineral resources in areas where flood control facilities are proposed can be accomplished by relocating facilities to areas where existing gravel pits are not present or by construction of an All Conveyance system, which would not require use of gravel pits as detention facilities. In addition, gravel pit operators will be fairly compensated to promote their relocation or relinquishment of valid permits or mining claims.

5.7.12 Topographic Alteration

Because topographic alteration is considered an insignificant impact and is essential to the proper function of the flood control facilities, no mitigation measures to reduce this impact are considered necessary.

TABLE 5-6

MITIGATION MEASURES

Geologic Hazard/Constraint	MITIGATION
Strong Ground Motion	C, D
Surface Fault Rupture	B, C, D
Slope Instability	B, G
Subsidence	B, C, D
Expansive Soils	B, C, D
Collapsing Soils	B, C, D
Liquefaction	B, C, D
Erosion and Sedimentation	B, C, E
Caliche	B, H
Corrosive Soils	B, D, I
Topographic Alteration	A
Mineral Resources	F, B

A) No mitigation
B) Relocate to avoid hazard/constraint or impacted resource
C) Engineering design modifications
D) Modification of existing soil conditions as appropriate
E) Minimize soil disturbance, use of water or chemical suppressants, revegetation, line channels
F) Fair compensation to operators for cost of relocation
G) Modification and/or buttress of unstable slopes, design discharge outlets to minimize effects on unstable channel sideslopes
H) Use specialized heavy equipment or blasting techniques to excavate
I) Use corrosive resistant materials for construction of facilities

attempt at artificial recharge was conducted in the valley in 1987 when two acre-feet of potable river water was injected into the ground-water basin (Coache, 1987). The river water was successfully injected and calcite precipitation apparently did not occur. Katzer and Brothers (1989) concluded that artificial recharge of the principal aquifers in the Las Vegas Valley was a viable method to increase recharge to the principal aquifers.

6.1.6. Ground-Water Usage

6.1.6.1 Shallow Aquifers

Due to the high TDS concentrations in the ground water of the shallow aquifer, the unit is not used for drinking water (Brothers and Katzer, 1988). Brothers and Katzer (1988) suggested that the shallow aquifer ground water could be used for irrigation in the central and eastern portions of the valley to assist in conserving potable water supplies currently used for irrigation and to reduce the rising shallow water table.

6.1.6.2 Near-Surface Reservoir

In 1976, Harrill reported that approximately five percent of the developed ground water in the Las Vegas Valley came from the near-surface reservoir. However, LVVWD indicated that the ground water in the near-surface reservoir is not used at present because of poor quality (Katzer, 1989).

6.1.6.3 Principal Aquifers

The total water use from all sources for Las Vegas Valley in 1989 was approximately 304,750 acre-feet. Approximately 21 percent or 64,550 acre-feet of the public water supply for Las Vegas Valley was obtained from wells completed in the principal aquifer. The remaining 78 percent or 240,200 acre-feet was from surface water imports from the Colorado River via Lake Mead. Southern Nevada has an allocation of 300,000 acre feet per year for consumptive use. Since credits are allowed for Colorado River water returned to Lake Mead, if returns amount to 180,000 acre feet per year, diversions would amount to 480,000 acre feet per year.

A breakdown of the 64,550 acre-feet of ground water produced in Las Vegas Valley during 1989 is described below. The North Las Vegas Well Field produced 4,270 acre-feet; the LVVWD Well Field produced 34,025 acre-feet; and the Nellis Air Force Base Well Field produced 1,707 acre-feet. An additional 24,548 acre-feet of ground water was estimated to be produced from all other permitted and domestic wells in the valley.

6.2 SPECIFIC ENVIRONMENTAL CONDITIONS BY SUBAREA

This section contains a discussion of ground water in the valley by subareas. Specific parameters of concern to the proposed project are related to recharge and discharge to the shallow and primary aquifers.

6.2.1 Northern Las Vegas Valley Subarea

6.2.1.1 Hydrogeologic Units

The hydrogeologic units of the shallow, near-surface, and principal aquifer systems in the valley are similar to the units in other parts of the valley as described in Section 6.1.2.

6.2.1.2 Ground-Water Occurrence and Flow

Shallow Aquifers

beneficial. The storm runoff water quality may be degraded by mixing with the effluent. However, the storm runoff may also dilute and help treat the effluent.

7.1.2 Surface Flows Subject to COE Review

The application of the COE regulatory process involves the review of potential effects of the discharge of dredged or fill material directly into areas identified as waters of the United States (including intermittent drainages, perennial flowing streams, and areas of wetland vegetation). The project area is characterized by a complex system of braided channels, including very small (one to two feet wide) watercourses that experience surface flows on an irregular basis. Because the determination of areas subject to COE regulatory review requires judgement concerning the frequency of water flow and vegetation associated with the watercourse, a field reconnaissance survey was conducted with COE personnel to evaluate the characteristics of a range of watercourses in the study area. This survey resulted in the determination that the areas considered waters of the United States for the purposes of COE review will include defined channels and areas of wetland or stream-related vegetation identifiable on the Flood Control Master Plan Facility maps (scale 1":2000'), including all known major washes in the study area and several small unnamed intermittent drainages.

The area of direct effect on waters of the United States includes the entire facility construction site, and potential indirect effects could occur up to 1000 feet downstream of facilities that would intercept and divert flow of intermittent drainages. No diversion of perennial flows is proposed. Areas of direct and indirect effects subject to review by the COE in association with the Section 404 permit process are indicated on Figures 7-3 to 7-16. Areas of major washes in developed urban areas, including some characterized by well-developed wetland vegetation, are identified in these Figures and are also subject to COE review.

7.1.2.1 COE Assistance on District Projects

The United States Congress authorized a reconnaissance study be performed by the U.S. Army Corps of Engineers (Corps) for the Las Vegas Wash and its tributaries, following a disaster declaration made in 1984. As a result of that study, completed in 1985, it was determined that there was a federal interest in solving the flooding problem in the Las Vegas Valley.

The Corps began the feasibility study of a federal flood control project on the Tropicana and Flamingo Washes in 1985. The feasibility study was re-scoped in 1988 to include an evaluation of projects along the Tropicana and Flamingo Wash systems. Upon completion of the feasibility study, the Corps of Engineers will begin the pre-construction engineering and design phase of the Tropicana and Flamingo Washes project. During the plan formulation phase, the Corps has determined that the Tropicana and Flamingo Washes project will cost approximately $174 million.

In FY 90-91, the Corps will finalize the study results and submit the report to the Corps' Board of Engineers for final approval. After the project is approved by the Board of Engineer, the Regional Flood Control District will be able to request Congressional authorization of the project in a 1992 Water Resources Bill. In 1994, the Regional Flood Control District will be able to request a construction appropriation to begin implementing the Tropicana and Flamingo Washes project.

In anticipation of federal participation, the District continues to build improvements along the Tropicana and Flamingo Washes and will ask for federal cost sharing credit against the local share of the federal project. The District has already been successful in obtaining preliminary approval of Section 104 of the 1986 Water Resources Development Act (WRDA) credit for the Red Rock Detention Basin and has requested Section 104 WRDA credit for the Upper Flamingo Detention Basin, which is programmed for construction in FY 90-91.

Also in FY 89-90, Congress authorized the Corps of Engineers to spend $300,000 on a reconnaissance study for Duck Creek Wash. The Corps began work on April 1, 1990 and it is anticipated that it will take 18 months to complete the reconnaissance study.

7.1.3 Summary of Significant Resources and Conditions

There are a variety of significant resources and issues related to the categories of surface water and water resources facilities. These significant water resources issues and facilities are summarized by subarea in Table 7-1. In general, the pattern of flow, flow rate, velocity, and water quality of flowing surface water are of principal concern in this section of the EIS. Clearly all water flowing or ponded on the surface should be classified as surface water resources. This includes storm water runoff and wastewater treatment plant (WWTP) effluent.

In addition to the surface waters, natural and man-made facilities which help to manage the surface waters are included in this consideration of surface water resources. This includes ponds, lagoons, detention/retention basins, channels, and washes. The category of water resources facilities has been included in this assessment because these facilities are significant and may not otherwise be included in the assessment. Other water resources facilities that are not related to flood control including: water development and processing facilities such as well heads, water treatment facilities, domestic water storage and conveyance facilities; wastewater collection and conveyance facilities; wastewater treatment plants and effluent conveyances; are also addressed in this section to evaluate potential impacts to these facilities. Any plans to manage flood flows in the study area will encounter these facilities at numerous locations.

The existing drainage facilities themselves are also surface water resources. The channels provide for both channel and overbank storage which attenuate peak runoff flow rates and reduce the potential for downstream flooding (although the overbank storage experienced in some areas may represent an existing flooding problem). In addition, the unlined channels and overbanks areas induce natural ground-water recharge during runoff periods and some may act as groundwater discharge areas at other times. Potential effects of flood control facilities on shallow groundwater are addressed in Section 6.0 of this EIS, and that topic is not repeated in this section.

Under existing conditions, much of the surface water occurring during storm events flows to Las Vegas Wash and to Lake Mead. Some portions of these flows may percolate into shallow aquifers, which also drain to Las Vegas Wash and to Lake Mead. As described in greater detail in Section 6.0 of this EIS, many of the tributary washes in the Las Vegas Valley act as discharge areas for shallow ground water during much of the year. As a result of these ground water discharges and WWTP discharges of effluent to these washes, perennial low flows and shallow subsurface flows are noted along the lower reaches of some of the washes. For this EIS, perennial low flows are defined as both continuous surface flows and the discontinuous pools of water which are connected by shallow subsurface flows down the washes. With this definition, perennial low flows have been identified along the lower Las Vegas Wash below the WWTP facility.

In 1987 the Las Vegas Valley obtained 176,000 acre-feet of water from Lake Mead. The maintenance of allocations from Lake Mead is in part dependent upon Colorado River return-flow credits allowed for the discharge of surface and near-surface waters into Lake Mead from Las Vegas Wash. Return flow credits are based on a return of a portion of water discharged by wastewater treatment plants to Lake Mead reservoir.

7.1.4 Relationship to Floodplain Management

Flood Insurance

The National Flood Insurance Program is managed by the Federal Emergency Management Administration (FEMA). Each of the governmental entities in the Las Vegas Valley maintains a floodplain map showing the location of the 100- and 500-year flood areas, and these maps are updated periodically by FEMA as local conditions change over time.

The District's Master Plan is comprised of flood control facilities which are designed to reduce the flooding hazard and protect lives and property - primarily for existing and planned developments in the Valley. The District will ensure that these proposed facilities will meet or exceed FEMA standards. Construction of the Master Plan facilities will lead to a significant reduction in the surface area currently designated as floodplain in the FEMA maps.

Current FEMA maps for the Valley reflect only those floodplain modifications which have resulted from construction of existing flood control facilities. As the Master Plan facilities are constructed, the FEMA maps will then be modified to reflect appropriate changes to the floodplain boundary. Such changes may make additional developed areas eligible for affordable flood insurance. However, the main objective of the District's Master Plan is to provide a greater level of flood protection to existing and planned developments. As a result, construction of the 10-year Plan facilities is not expected to "open up" new areas for development within the existing floodplain boundary.

Floodplain Management

Executive Order No. 11988 (42 F.R. 26951) which was signed on May 24, 1977, requires that federal agencies provide leadership and take action to "avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development whenever there is a practicable alternative..."

The EIS included evaluation of natural (Sections 4,5,6,7), biological (Section 8), physical (Section 9), and environmental actions that commonly occur in a floodplain. Those actions which have the potential for causing definable short and long term adverse impacts to the natural and beneficial floodplain functions have been identified - including measures for resource protection, minimization of damage, restoration, and preservation.

Implementation of the District's Master Plan will result in a reduction in size of the floodplain boundary below the detention facilities. While certain resource values (i.e., intermittent wetlands and biological habitat) will be lost, the overall beneficial impact on existing and planned developments in the original floodplain will be significant.

The District's Master Plan is designed to provide a greater level of protection to existing and planned developments in the original floodplain. As such, the proposed action will fulfill those provisions of E.O. 11988 which require action to "reduce the risk of flood loss" and to "minimize the impact of floods on human safety, health and welfare." In addition, construction of the flood control facilities will not directly promote development in that the size of the floodplain boundary will be effectively reduced as a result of the greater flood protection afforded by those new facilities.

7.2 SUMMARY OF SPECIFIC ENVIRONMENTAL CONDITIONS BY SUBAREA

The majority of the water resources environmental evaluations for the study area relate to the existing system to manage stormwater runoff. This system is mainly comprised of natural and man made

7.3.8 Perennial Low Flow Areas

Areas of perennial low flows and near surface flows under existing conditions are important as a biological and recreational resource. Changes in flow patterns or direct modification of these areas could adversely affect the biological and recreational resource values of these areas. The locations of these areas are further described in Section 8.3 of this EIS. Of particular importance is the Las Vegas Wash and some locations in the Tropicana Wash, Flamingo Wash, Duck Creek, Paradise Valley, Cottonwood Valley, and the Red Rock Canyon Wash.

7.3.9 Colorado River Return Flow Credit

In 1987, 174,000 acre feet were diverted from Lake Mead for use in the Las Vegas Valley and 86,000 acre feet were credited as return flow, for a consumptive use of 88,000 acre feet. Total Colorado River consumptive allocation to southern Nevada is 300,000 acre-feet per year. The maintenance of adequate supplies given this allocation is in large part dependent on return-flow credits allowed for the return of water through Las Vegas Wash. Potential effects on WWTP operation, or changes in shallow groundwater levels in the Las Vegas Wash that reduce flows reaching Lake Mead could adversely affect the return flow credit, resulting in limitations on the Las Vegas Valley water supply. As described in Section 6.0, facility-related impacts on groundwater levels can be mitigated to less than significant levels.

7.4 FACILITY-RELATED ENVIRONMENTAL EFFECTS

The evaluation of the environmental impacts and effects of a flood control project which is still in the early design phases must be based upon certain key assumptions. Some of the most significant of these assumptions are that the project will be properly designed, constructed correctly and in the proper sequence, properly operated and will, in fact, do what it is designed to do. The engineering design of flood control facilities was the subject of the Master Plan (Montgomery Engineers, 1986), and is not repeated in this EIS. It is understood that preliminary and final design analysis will further refine the design of the proposed system and that, for any one wash or specific facility, some construction or operational changes may occur to improve the functional effectiveness of individual facilities and incorporate environmental mitigation measures. This analysis of the alternative flood control systems assumes that the principal design characteristics of each final in-place facility will not change significantly from the design currently proposed under each alternative. A summary of the general effects that may occur during facility construction or operation is presented in Table 7-8. These effects are discussed below.

7.4.1 Construction

Construction impacts could be significant especially if a storm occurs during the construction period. It is assumed that proper design and construction will minimize potential impacts to domestic water and sewage collection systems and to WWTPs. However, the possibility exists that construction activities may disrupt normal operation of these facilities. In this case there could be interruptions in service with a period of no domestic water supply or fire protection water in the vicinity of the construction site. An unplanned break in a sewer line would probably not be noticed by most users, but any raw sewage released at the construction site would pose a health hazard to persons at the site and in downstream areas. Construction damage to a WWTP is unlikely but could probably be handled by temporarily using another portion of the WWTP until repairs were completed. Damage to a WWTP could also result in a release of raw sewage, partially treated sewage, or sludge which would be a health hazard to persons at the site or in downstream areas.

TABLE 7-7

POTENTIAL ENVIRONMENTAL CONCERNS
SURFACE WATER RESOURCES

	POTENTIAL CONCERNS[1]							
Surface Water Resources[2]	Increased Flood Hazard	Flow Pattern Changes	Increased Erosion	Reduced Groundwater Recharge	Sediment Transport Changes	Water Quality Degradation[3]	Construction Disturbance	Water Rights
Storm Water Runoff	X	X	X	X	X	X		X
WWTP Effluent		X				X	X	
Existing Detention/Retention Basins	X	X					X	
Storm Water Drainage Facilities	X	X	X		X		X	
Domestic Water System							X	
Sewage Collection System							X	
WWTPs	X					X		
Perennial Low Flow Areas		X						
Lake Mead Return Flow Credit				X				X
Floodplain Management	X	X	X	X	X			

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[1] Potential concerns represent potential impacts as discussed in Section 7.3

[2] Surface water resources are discussed in Section 7.3

[3] Water quality effects considered in this column refer to the increased downstream transport of contaminants other than water-borne sediments

TABLE 7-8

POTENTIAL ENVIRONMENTAL IMPACT
FLOOD CONTROL SYSTEM CONSTRUCTION AND OPERATION

	POTENTIAL IMPACTS[1]								
Facility Characteristics[2]	Increased Flood Hazard	Flow Pattern Changes	Increased Erosion	Reduced Groundwater Recharge	Sediment Transport Changes	Water Quality Degradation[3]	Construction Disturbance	Water Rights	Floodplain[4] Management
Construction									
Construction Activities (All Structures)	NI	NI	NS	NI	NS	NS	NS	NI	NS
Direct Operation									
Closed Conveyances	NI	NS	NI	NS	NS	NI	NS	NS	NS
Lined Channels	S	S	NI	NS	NI	NS	NS	NS	NS
Unlined Channels	NS	NS	S	NI	S	NS	NS	NS	NS
Detention Basins	NS	NS	NI	NI	S	NI	S	NS	S

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[1] Potential impacts are categorized according to potential concerns identified in Section 7.3 related to specific water resources

S = significant impact
NS = no significant impact
NI = no anticipated impact

[2] Facility characteristics refer to activities, operational characteristics, and facilities that may result in the impacts identified

[3] Water quality impacts in this column refers to the increased downstream transport of contaminants other than water-borne sediments

[4] Floodplain impacts are associated with reduction of the area categorized as floodplain.

TABLE 7-10 (concluded)

	CONVEYANCE/DETENTION	ALL CONVEYANCE	NO PROJECT
PERENNIAL LOW FLOWS			
Construction	Minimal Impact	Minimal Impact	No Impact
Direct Operation	Some Changes in Flows	No Impact	No Impact
Indirect Operation	No Impact	No Impact	No Impact
Cumulative Impacts	None	None	None
COLORADO RIVER RETURN FLOW CREDIT			
Construction	No Impact	No Impact	No Impact
Direct Operation	No Impact	No Impact	No Impact
Indirect Operation	No Impact	No Impact	No Impact
Cumulative Impacts	None	None	None
STORM WATER RUNOFF PATTERNS			
Construction	Minor Changes During Construction	Minor Changes During Construction	No Impact
Direct Operation	Ponding Along Diversion Structures and in Detention Basins	Higher Flow Rates in Conveyances	No Impact
Indirect Operation	No Impact	No Impact	No Impact
Cumulative Impacts	None	None	None
FLOODPLAIN MANAGEMENT			
Construction	No Impact	No Impact	No Impact
Direct Operation	Reduction in Floodplain Area	Reduction in Floodplain Area	No Impact
Indirect Operation	Reduction in Floodplain Area	Reduction in Floodplain Area	No Impact
Cumulative Impacts	Increased Protection from Flooding Hazards	Increased Protection from Flooding Hazards	Increased Risk of Flooding Hazards

Information regarding the distribution of wildlife species in the region and occurrence within vegetation types was derived from many sources, including: 1) personal and in litt. communications (Baepler, 1988; Cole, 1988; Hardenbrook, 1988; Jones, 1988; Maley, 1988; Marlow, 1988; O'Farrell, 1987; Padilla, 1988; Pratt, 1988; Slone, 1988; Turner, 1988); 2) museum collections at the University of Nevada, Las Vegas (UNLV) Museum of Natural History and the southern division of the Nevada State Museum; 3) checklists of regional fauna (Baepler, no date; BLM, 1979a, 1979b, no date-a, no date-b; Lawson, 1977; USFWS, 1974, 1984); 4) theses, publications, and agency reports (Blake, 1978; Burt and Grossenheider, 1976; Clark and Wheeler, 1987; Christensen, 1970; Hall, 1981; Herron et al., 1985; Johnsgard, 1975; Miller, 1974; Ryser, 1985; Schmidt and Gilbert, 1978; Schwartz et al., 1978; Stebbins, 1985; Zeveloff, 1988), and 5) site characterizations conducted by biologists familiar with the biological and botanical resources of the Mojave desert as described later in this report under Desert Tortoise Surveys.

8.1.1.1 Upland

The upland vegetation types and wildlife habitats of the project area consist of low (below 3,000 feet elevation) and high (above 3,000 feet elevation) desert types which are locally influenced by varying edaphic conditions. The two common types encountered in the project area include creosote bush scrub and blackbush scrub/Joshua tree woodland (CCDCP, 1987). Two less common types include: desert calcicolous scrub, which occurs on calcareous substrates; and, pinyon-juniper woodland, which occurs at the western edge of the project area above 4,000 feet (Thorne et al., 1981).

Creosote Bush Scrub

Creosote bush scrub includes the Mojave creosote bush scrub of Holland (1986) and the low desert type of USFWS (1987). This is the most abundant vegetation type of the lower elevation areas of the Mojave Desert, primarily below 3,000 feet. Creosote bush scrub is the predominant vegetation type in the Las Vegas Valley (CCDCP, 1987). It is characterized by widely spaced shrubs with an approximate average vegetative cover of 32 percent in the project area (USFWS, 1987). Two shrub species dominate this vegetation type, creosote bush (Larrea divericata) and burro-weed (Ambrosia dumosa). Other common and characteristic shrubs and perennial herbs of creosote bush scrub in the project area include Shockley goldenhead (Acamptopappus shockleyi), four-wing saltbush (Atriplex canescens), brittle-bush (Encelia farinosa), Mormon tea (Ephedra nevadensis), wild buckwheat (Eriogonum fasciculatum), rattany (Krameria spp.), wolf-berries (Lycium spp.), cholla and beaver-tail cactus (Opuntia spp.), turpentine-broom (Thamnosma montana), and Mojave yucca (Yucca schidigera) (at higher elevations). Numerous annual herbs occur following sufficient rainfall, primarily during the spring.

Creosote bush scrub contains several subtypes which are controlled by differences in soil type (edaphic conditions), slope and moisture gradients, and slope aspect. Two such types occurring in the project area are desert psammophytic scrub and gypsicolous scrub (Thorne et al., 1981).

Desert psammophytic scrub consists of plants which are adapted to survival on sandy substrates, especially sand dunes. While the typical creosote bush scrub species also occupy sandy substrates, many taxa are mostly restricted to these habitats, such as: sand verbenas (Abronia micrantha, A. villosa), onyx flower (Achyronychia cooperi), Mojave croton (Croton californicus var. mohavensis), silky dalea (Dalea mollis), speckle-pod (Dithyrea californica), bindweed heliotrope (Heliotropium convolvulaceum var. californicum), galleta grass (Hilaria rigida), evening-primroses (Oenothera spp.), Indian ricegrass (Oryzopsis hymenoides), Spanish needle (Palafoxia spp.), canaigre (Rumex hymenosepalus), and tiquilias/coldenias (Tiquilia [Coldenia] spp.) (Holland et al., 1979; Thorne et al., 1981). Sandy areas such as these are fairly restricted in the project area, with the best example occurring in sand dunes of the Las whipplei var. multigeniculata). In addition, all cactus and yucca species are fully protected under the Nevada Cactus and Yucca Law (NDF, 1987b).

Seven BLM sensitive or federal candidate species are known to, or could potentially, occur in the project area and include Charleston angelica (Angelica scabrida), Spring Mountain milk-vetch (Astragalus remotus), streaked Mariposa lily (Calochrotus striatus), Pahrump Valley buckwheat (Eriogonum bifurcatus), low grease-bush (Forsellesia pungens var. glabra), white-margined beardtongue (Penstemon albomarginatus), and bicolored penstemon (Penstemon bicolor spp. bicolor).

Five species of special concern listed on the NNNP's (1987) "watch list" are known to occur in the project area and include ivory-spined Utah agave (Agave utahensis var. eborispina), Clark Mountain Agave (Agave utahensis var. nevadensis), Merriam's bear poppy (Arctomecon merriamii), Knapp's brickellia (Brickellia knappiana), and Mojave cryptantha (Cryptantha tumulosa). In addition, six other species of special concern listed on the NNNPS's (1987) "other rare" list are known to or could potentially occur in the region and include Shockley rock-cress (Arabis shockleyi), Ackerman's milk-vetch (Astragalus ackermanii), Nye milk-vetch (Astragalus nyensis), Ripley gilia (Gilia ripleyi), intricate large-headed rock-daisy (Perityle megalocephala var. intricata), and A. Nelson phacelia (Phacelia anelsonii).

8.1.2.2 Sensitive Wildlife

Sensitive wildlife species in Nevada consist of legally protected species, federal candidates for listing, and species of special concern. Legally protected species include those federal-listed as threatened or endangered (USFWS, 1989a) and/or state-listed as endangered or rare (NDW, 1984). Federal candidate species (USFWS, 1989b) include taxa which are currently under consideration for federal listing as threatened or endangered. Category 2 federal candidates are taxa for which data on rarity are sufficient for listing, but for which data on threats and/or distribution are insufficient. Species of special concern include those considered to be: 1) sensitive by BLM; 2) fully protected, game, furbearer and other sensitive species by NDW (1984); and 3) birds declining on an a nation-wide basis, and therefore, listed on the National Audubon Society's Blue List (Tate, 1986). Although all raptors are classified as protected species by the State of Nevada, this analysis focused on species with other sensitive classifications (such as ferruginaus hawk, a federal candidate species) and species of interest to NDW (such as prairie falcon). The focused effort approach was developed following consultation with NDW.

Based on literature review, personal communications, and a reconnaissance field survey, 27 sensitive wildlife species are known or have the potential to occur in the project area. Reference sources include those described in Section 8.1.1. Information on these species is provided in Table 8-2. Known locations in the project area are shown in Figure 8-2.

Of the 27 species, four are federal-listed species (desert tortoise, brown pelican, bald eagle, and American peregrine falcon). The latter two species are also state-listed endangered species. A Biological Assessment for the desert tortoise was prepared for BLM and submitted to USFWS as part of the Section 7 consultation as required by the Endangered Species Act. A "no-jeopardy" federal Biological Opinion was issued by USF&WS on 29 August, 1990. A copy of this Opinion is included in Section 3 of this document. The opinion included USF&WS required mitigation measures and habitat compensation developed from information regarding impacts and mitigation contained within the Biological Assessment. Two additional state-listed (rare) and BLM sensitive species are known to occur in the project area: Gila monster and spotted bat. Seven birds and two mammals are federal candidates and/or state-protected

Floodways

Establishment of floodways will result in the temporary loss and disturbance of wetlands due to construction of containment dikes and grade structures within the floodway. Construction activities will include earth-moving in existing natural channels and drainages, thus removing some wetlands vegetation. Floodway establishment will likely occur within existing natural drainages, and will include creation of a 50-foot-wide pilot channel. Earthen berms would be constructed on either side of the pilot channel. Floodways will be unlined. As such, vegetation will recover within the floodway. Portions of the flood plain riparian vegetation may become isolated by the channel berms. This vegetation may be expected to decline in vigor and extent over time as it previously depended on an unconfined water regime. Conversely, recovery of riparian vegetation within the channel and along earthen berms is expected to be enhanced due to concentration of the available water supply. The recovery will include both native wetlands and undesirable weedy species. These impacts are considered nonsignificant because 1) the loss of wetland vegetation in the floodway is restricted to localized areas associated with pilot channels and berms and is temporary; and 2) the invasion of undesirable species would likely be limited to small areas.

Overall, floodways are expected to have minimal adverse to potentially beneficial impacts, if the area disturbed represents a minor portion of the existing wetlands and the potential introduction of undesirable weedy vegetation is monitored and eradicated if necessary. Control of such vegetation may be accomplished with a revegetation program using native species.

Detention Basins

Although most detention basins will be located off channel, some will be within channel routes. Establishment of the basins will result in the removal of native upland vegetation. The detention basins may allow undesirable weedy vegetation to become established, depending upon the duration and frequency of inundation and the nature of maintenance procedures.

Disturbance of upland vegetation due to construction of detention basins is considered a significant, but fully mitigable, impact. Establishment of undesirable weedy vegetation is a potentially significant impact, depending on the eventual range of this vegetation type in detention basins, throughout the study area.

Other Structures

Construction of other structures, including bridges, culverts, box conduits, and pipelines, would involve varying amounts of earth moving. Pipelines and box conduits would result in the permanent removal of small amounts of vegetation at the structure location. In addition, relatively small areas of vegetation would be temporarily disturbed due to access during construction. Due to the locations of pipelines and box culverts, most of the natural vegetation to be disturbed would be upland. Impacts caused by construction of pipelines and box conduits are not considered significant because: 1) a relatively large amount of upland vegetation occurs in the study area and 2) a substantial portion of the total pipeline/conduit system would traverse urban areas that have been previously disturbed.

The construction of bridges and culverts would result in removal of small areas of upland and wetland vegetation. The latter would consist mostly of riparian scrub types. Impacts to upland vegetation are not considered to be significant due to the relatively large amount of similar habitat occurring in the study area. Impacts to wetland vegetation caused by construction of bridges and culverts are expected to be adverse, but minimal due to the limited amount of this habitat type to be disturbed.

One specific indirect impact to tortoises potentially resulting from operation and maintenance activities is diversion of water from downgradient habitat, as described in Section 8.3.2.1. Based on results of the walk-over surveys, none of the 12 proposed dikes that will divert runoff occurs in habitat with high or very high tortoise densities (Table 8-18). Most (eight) occur in habitat containing very low or low tortoise densities. Considering the relatively low tortoise densities involved, the likelihood of habitat disturbance prior to dike construction, and the apparently limited effects observed elsewhere (Schlesinger and Jones, 1984; Schlesinger et al., 1989), the diversion of runoff due to construction of CCRFCD dikes is not likely to result in significant impacts to the desert tortoise.

8.3.2.5 Aquatic Resources

Operations of the proposed facilities would result in adverse impacts to aquatic resources. Wetland (=aquatic) vegetation would be modified primarily by periodic clearing, herbicide application, and/or dredging (if required) and by the establishment of new species, most of which would be nonnative and undesirable. These effects would, in turn, impact the fauna associated with aquatic habitats by decreasing the value of the habitats. Both sensitive and common aquatic species would be adversely affected. These impacts are also described in Sections 8.4.2.1. Implementation of appropriate mitigation measures would be necessary to reduce these impacts to a nonsignificant level.

Two types of wetland vegetation were identified in the project area; desert marsh (DM) and desert wash scrub (DWS). Utilizing Tables 8-6 and 8-8, the number of acres and duration of disturbance for each vegetation type was calculated. For vegetation types with a dual designation, such as creosote bush scrub/desert wash scrub (CBS/DWS), the initially named type was dominant and assumed to occupy 60% of the facility. If all of the facilities were constructed, a total of 103.6 acres of DWS and 14.5 acres of DM would be disturbed. A total of 53.6 acres of the DWS and 7.2 acres of the DM would be expected to be permanently disturbed. This information is summarized in Table 8-19.

8.4 ENVIRONMENTAL EFFECTS BY ALTERNATIVE

The environmental effects of the Detention/Conveyance, All Conveyance, and No Project alternatives are discussed below. Because the Detention/Conveyance alternative was identified as the recommended alternative from a cost and engineering standpoint (Montgomery Engineers, 1986), that alternative is presented below in Section 8.4.1 followed by a comparison with the All Conveyance alternative in Section 8.4.2. As discussed later, the Detention/Conveyance and All Conveyance alternatives are quite similar, with the exception of the number and size of the detention and debris basins. As such, the impact assessment for the All Conveyance alternative (Section 8.4.2) will focus on the differences between it and the Detention/Conveyance alternative.

8.4.1 Detention/Conveyance Alternative

A summary of the potential impacts due to the Detention/Conveyance alternatives is provided in Table 8-20. These impacts are organized by impact type, resource affected, and location of impact by subarea. The Detention/Conveyance alternative would result in approximately 2155 acres of temporary and permanent habitat disturbance from the construction of 53 detention basins and 16 debris basins. About 48 linear miles of dikes and 186 and 11 miles of lined and unlined channels, respectively, are also proposed under this alternative. Approximately 105 miles of pipeline/conduit are planned as well; however, most of it will be constructed within developed areas and would not have significant effects on sensitive biological resources. This alternative could potentially result in disturbance to, or removal of, 1620 acres of tortoise habitat, including 1292 acres of permanent disturbance and 328 acres of temporary disturbance. The following represents a summary of impacts by each subarea.

construction of dikes between the Detention/Conveyance (48 linear miles) and All Conveyance (44 linear miles) alternatives.

Despite less disturbance (fewer acres of basins) due to this alternative, potential impacts to tortoises could be greater. For example, implementation of the All Conveyance alternative in and near the Southwest Las Vegas Valley subarea would result in more habitat segmentation and other disturbance overall. Although less tortoise habitat would be removed for detention basins, there would be a substantial increase in habitat disturbance due to channels, dikes, and floodways. This increase in disturbance would be significant due to the location and type of facilities. These would include linear facilities in areas which contain primarily high estimated densities of tortoises. As such, not only would increased acreage of high quality tortoise habitat be lost or disturbed, but more potential barriers to tortoise movement would also be constructed.

Differences between the two alternatives would probably not result in relative differences in the magnitude and scale of impacts to tortoises for the North Las Vegas Valley, Central Las Vegas Valley and Henderson subareas. The All Conveyance alternative could potentially represent an increase in habitat disturbance to tortoises in the Boulder City area. Relative to the Detention/Conveyance alternative in Boulder City, the All Conveyance alternative includes more floodways south of the city. Although estimated tortoise densities, based on field survey results, were generally very low for Boulder City, relatively higher densities were noted in Floodway Sites 4108-26 and 4109-28. As such, an increase in area to be used as floodways south of Boulder City could potentially result in greater disturbance to tortoise habitat.

8.4.3 No Project

Without the proposed project, flood control facilities would be installed with each new development in the region in a much less coordinated and programmatic manner. As such, there will be a wide variation in the nature, size, and efficiency of the flood control facilities. More importantly, the level of environmental protection would be much less and would not be based on an understanding of the regional impacts. Hence, many of the biological mitigation measures recommended in Section 8.5 would not be implemented. As such, there is a strong likelihood that the No Project alternative would ultimately result in more significant biological impacts than the other two alternatives.

The No Project alternative could also result in major adverse impacts to the Las Vegas Wash, a highly sensitive regional biological resource. Nearly 80 percent of the wetlands in the Las Vegas Wash have been lost due to unchecked erosion since the early to mid-1970s (Bostick, 1988). Most of the erosion occurred during floods caused by summer rains in 1975 and 1984. This erosion is expected to continue unless flood control structures are installed to alter the existing hydrologic regime. Continued loss of wetlands would represent a decrease in habitat for aquatic and wetlands-associated plants and wildlife. Many of the sensitive species described in Table 8-2 utilize the wetlands of the Las Vegas Wash for at least a portion of the year.

8.5 PROGRAMMATIC MITIGATION MEASURES

Programmatic mitigation measures were developed for the Master Plan to avoid or reduce potential significant impacts to biological resources. As such, the measures are broadly defined and applicable for relatively large groups of sensitive resources (such as, all federal candidate/BLM sensitive plants) over the entire project area. With some exceptions, the measures were not designed for a single species, facility, or location. Instead, these measures mostly represent approaches for mitigation for

6) Assess the potential impacts to the sensitive resources due to construction, operation, and maintenance of the facility. Include an assessment of all indirect impacts to these and any other sensitive biological resources. Indirect impacts may occur both on and off-site. For example, access roads and downstream effects may result in off-site impacts.

7) Identify the programmatic mitigation measure that applies to the impacts of the proposed facility. These programmatic mitigation measures (A-M) are listed in Table 8-21. They have been developed for each major category of sensitive resources.

8) Select and implement the specific measures listed under the programmatic mitigations (A-M, Table 8-20) as necessary. Implementation will usually involve documentation of the occurrence of the resource and avoidance when feasible. In addition, species listed by the state or federal government will require coordination with USFWS, BLM, and/or NDOW.

To assist in this procedure, a current database on sensitive biological resources should be consulted. Data reviewed should be project-specific and may be obtained from a region-wide consolidated database maintained and periodically updated by CCRFCD, or from a review of currently available data for the vicinity of the proposed project.

8.5.2 Mitigation Measures

Thirteen mitigation measures (A-M) are described in Table 8-21, including four for sensitive plants, four for addressing wetlands, and five for sensitive wildlife. The measures are categorized primarily by degree of legal protection of plant and wildlife species, or by severity of potential impact to wetlands.

The need for these measures will be determined based on a site-specific field survey at the locations of the facilities as they are proposed. If certain sensitive resources are present and could be adversely affected, the specific measures listed in Table 8-21 should be implemented to reduce the potential impacts to nonsignificant levels. Potential impacts are summarized in Table 8-20.

An additional mitigation measure is recommended to reduce impacts to vegetation downgradient of dikes. As noted earlier in Section 8.3.2.1, effects on vegetation due to diversion of water are likely to occur for at least 1,000 feet downgradient of the dikes. The effects would likely include decreases in biomass and plant density of dominant shrubs and an increase in annuals. To reduce these effects, small low-flow drains would be installed in the dikes where these dikes intercept small natural drainages. The low-flow drains would allow passage of runoff during smaller-scale rainstorms. However, during large-scale storms accompanied by relatively larger amounts of runoff, the drains would naturally become plugged by debris. As such, water from small-scale storms would be available to downgradient vegetation, but high-velocity flow water would be directed to flood control facilities. Water in high-velocity runoff flows generally is not available to downgradient vegetation even if not directed away by dikes. These drains would be checked after larger-scale storms to remove debris.

8.5.3 Mitigation for Use of Herbicides

Herbicide use by local governments may adversely impact sensitive biological resources of the area. To lessen these potential impacts, the District should evaluate their current and future herbicide use program. Herbicides may impact sensitive vegetation, aquatic organisms, and wildlife, both onsite and downstream of the treatment area.

To mitigate these potential impacts, the District should evaluate the potential adverse effects of each herbicide it may use. These include residual effects onsite and downstream. For example, removal of vegetation from the flood control channels results in a loss of sensitive wetland vegetation which has direct and indirect impacts on aquatic organisms and wildlife species that utilize it. Herbicide residue may drift off-site (airborne or waterborne) and impact biological resources not intended to be treated.

Other methods, such as mechanical or engineered, should be considered to control unwanted vegetation. If some vegetation removal is required, then low-impact mechanical means should be utilized instead of herbicides. While mechanical removal of vegetation from facilities such as channels will be locally significant, the potential for downstream contamination from herbicides would be eliminated.

8.5.4 Mitigation for Desert Tortoise

The following mitigation measures for desert tortoise have two objectives: 1) minimize loss of tortoise habitat and 2) reduce loss and displacement of this threatened species. These mitigation measures are normally applicable to situations where observations of tortoises and/or tortoise sign indicate population densities are in excess of the very low density levels (0-10 tortoises/square mile). Because estimated densities for many of the proposed flood control structures and immediately adjacent habitat are in the very low category, it is anticipated that some of the proposed mitigation measures may not be applicable for all proposed facilities. For example, tortoise fencing would not be appropriate for areas where observed densities are very low in both the construction area and adjoining parcels. However, pre-construction surveys would normally be appropriate and prudent in all cases where land is to be disturbed. These measures are summarized in Table 8-22, and included in the Biological Opinion. Additional mitigation and refinement may be developed in consultation with USFWS for portions of the project not addressed in the Biological Opinion.

8.5.4.1 Pre-Construction Measures

Pre-construction tortoise mitigation measures detailed in the USFWS Biological Opinion, included as an appendix, include:

1. A worker education program describing desert tortoise protection measures.
2. Monitoring of surveying and geotechnical evaluations by a qualified biologist(s).
3. Installation of tortoise proof fencing for certain facilites.
4. Pre-construction surveys involving both tortoise relocation and removal.

8.5.4.2 Construction and Post-Construction Measures

The size of any temporary disturbance area would be limited to the greatest extent possible. The area of allowable disturbance would be clearly marked with temporary construction fencing, and contractor specifications would include a requirement that no disturbance is to occur outside the fenced area. Where practical, disturbance in construction staging areas should be limited to crushing, rather than clearing of vegetation. This will allow temporarily disturbed habitat to recover more quickly.

The number of construction roads should be limited to reduce: 1) impacts to tortoise habitat; and

ADDITION TO TABLE 8-2

COMMON NAME[1]	SCIENTIFIC NAME[1]	PROTECTION STATUS[2]	REGIONAL DISTRIBUTION[3]
Federal Candidate, BLM Sensitive, and/or State Protected Species			
45. Arizona southwestern toad	Bufo microscaphus microscaphus	/ /C2/	Historic reports within Las Vegas Valley, suspected in major washes. Known by museum specimens collected in 1940s. Disjunct distribution pattern and is likely to hybridize with the more common Woodhouse toad. Extremely sensitive to human presence and disturbance, and may therefore be extirpated from portions of Flamingo Wash.

TABLE 8-19. ACRES OF WETLAND/RIPARIAN HABITAT DISTURBED

		VEGETATION TYPE*											
FACILITY	ID#	DWS/CBS		CBS/DWS		DWS		DM		DWS/RUD		CBS/DM	
		P	T	P	T	P	T	P	T	P	T	P	T
N3	1	43.6	43.6										
N4	23	0.1	0.1										
S2	61			2.3	2.3								
S10	60			1.4	1.4								
N4	23	0.1	0.1										
N7	4							0.1	0.1				
N10	13									0.1	0.1		
S26	66			10.0	1.0								
S11	2					3.3	3.3						
S20	17	8.3	8.3										
S26	67												
S26	85			3.3	3.3								
S29	39			2.9	2.9								
H3	12											0.1	0.3
H3	13							6.8	6.8				
H3	14							0.1	0.1				
H3	17							0.1	0.2				
H3	56			6.8	6.8								
2618	57			1.3	1.3								
B2	35					0.1	0.2						
B4	36					1.1	1.1						
B4	41					3.4	3.4						
B4	44			7.3	7.3								
4110	40					0.1	0.1						
4110	43			0.1	0.1								
SUBTOTAL		52.1	52.1	35.4	26.4	8.0	8.1	7.1	7.2	0.1	0.1	0.1	0.3
	60%	31.3	31.3										
	40%			14.2	10.6							0.1	0.1
TOTAL		31.3	31.3	14.2	10.6	8.0	8.1	7.1	7.2	0.1	0.1	0.1	0.1

DISTURBANCE	PERMANENT	TEMPORARY	TOTAL
DWS	53.6	50.1	103.7
DM	7.2	7.3	14.5

ASSUMPTIONS:

1. IF 2 VEGETATION TYPES LISTED (DWS/CBS) ASSUME 60% OF DOMINANT VEGETATION TYPE.
2. NO AREA LESS THAN 0.1 ACRES

* DWS = DESERT WASH SCRUB
DM = DESERT MARSH
CBS = CREOSOTE BUSH SCRUB
RUD = RUDERAL

TABLE 8-21

SUMMARY OF PROGRAMMATIC BIOLOGICAL MITIGATION MEASURES

MITIGATION DESIGNATION	RESOURCE OF CONCERN	DESCRIPTION OF MEASURE
D	Cactuses and Yuccas	• Conduct preconstruction survey to determine presence/extent of cactus and yucca species; consult with NDF if plants found. • Avoid to extent possible. • If individual plants cannot be avoided: 1) obtain permit from NDF to take; 2) purchase tags ($1/tag) and place one on each plant to be removed; 3) transplant individual plants to similar, but undisturbed habitat; 4) disseminate plants to research organizations or nurseries as directed by NDF; or 5) use to revegetate temporary disturbance areas within project area.
		(ADDENDUM)
N	Avian species protected by the Federal Migratory Bird Treaty Act	• Conduct seasonal pre-construction survey within suitable habitat to determine extent of occurence; consult with NDOW. • Avoid suitable habitat to the maximum extent feasible. • If nesting habitat is unavoidable, minimize construction during periods of high breeding activity. If construction occurs during periods of high activity, monitor for the presence of nests and nestlings and flag these resources for avoidance.

may help to define neighborhood communities, and/or serve as a buffer to adjacent land uses, thereby creating a beneficial impact. Agricultural areas, particularly where field crops or orchards are planted, would also be sensitive to channel crossings because irrigation systems and cultivation patterns could be disrupted. Livestock grazing could potentially be affected by channels if such crossings significantly separated portions of a continuous allotment. However, given the size, current designation and livestock distribution of these allotments, such impacts would be considered minimal.

If located adjacent to existing residential neighborhoods, channels will impact those areas directly if the right-of-way would require portions of land presently used for other purposes, or proposed for other purposes. If properly mitigated, channels adjacent to residential areas would not affect existing use.

Floodway and immediately adjacent areas may be suitable for some forms of recreation, such as bird watching and bicycle, equestrian, or hiking trails. These recreation uses may be particularly popular in areas of perennial flow where riparian and wetland vegetation is allowed to establish in the floodway. Linear flood control facilities such as channels may be particularly appropriate for use as trails. Detention basins may be appropriate for a variety of multiple use scenarios such as sporting fields.

Beneficial impacts may result in some circumstances from channel placement by the addition of linear buffer spaces which separate non-compatible land uses. For example, providing a natural channel which separates a residential area from an industrial area may achieve a positive neighborhood change. Consideration for health and safety concerns would also be necessary and these or other adverse effects may, in some cases, override any potentially beneficial impacts.

9.4.2.2 Culvert/Box Culvert, Pipeline, Bridge

In general, these three types of facilities would cause the least degree of direct, permanent impacts since they would be constructed either underground or in conjunction with streets, railroads, or other structures. These structures would usually be located within existing street or highway rights-of-way. In certain areas the development of new bridges, or the expansion of existing bridges could benefit the surrounding community. An exception would be where bridge or culvert structure design requires additional land area, encroaching on other uses in sensitive areas, or a pipeline that traverses a property supporting a conflicting land use. In general, the land use impacts of these facilities would be minimal.

9.4.2.3 Dike/Levees

The effects of these facilities are similar to those of the channels; such as dividing or eliminating existing uses, or causing a barrier between areas of common use. However, these structures would be located along drainages often unsuitable for residential or other uses. Therefore, dike and levee structures will result in generally low or moderate levels of impact.

9.4.2.4 Detention/Retention Basin, Debris Basin

Of all types of facilities, the basins will occupy the greatest concentrated amounts of land area. The most severe direct impacts may result from the elimination or division of existing uses (Types 1, 2) if basins cannot be located to avoid land use conflicts. The joint use of detention/retention basins for recreation purposes was considered and rejected by representatives of the Clark County School District on the basis that the availability of recreation facilities would be reduced during or after rains. Joint use of such facilities by other jurisdictions or private recreation users is potentially feasible.

9.4.3 Indirect Operational Impacts

Indirect impacts may occur as a result of the operation of flood control facilities. An example of a safety concern is the potential for persons to be injured or drown by falling into open water, such as a channel or detention basin. Examples of adverse health effects include the possibility of persons or animals becoming ill from ingestion of untreated water, or the transmission of disease carried by insects drawn to standing water in detention basins.

Another adverse indirect impact is the attraction of undesirable activities to the facility. Noise from all-terrain vehicles and other unauthorized recreation use would be an indirect, adverse impact on nearby residences or other noise-sensitive areas. This impact is of greatest concern with respect to detention basins, debris basins, and floodways, but may also occur in lined and unlined channels.

Flood control facilities also offer opportunities for potential beneficial indirect impacts associated with enhanced recreational opportunities. Detention basins may be developed as park facilities and could provide substantial recreation opportunities in outlying areas that would not otherwise be available. Debris basins may provide similar opportunities Floodways provide opportunities for other recreational interests, such as nature trails and bikeways. These areas may offer a significant local amenity in areas of perennial flow if riparian and wetland vegetation is allowed to establish within the floodway.

9.4.4 Summary of Potential Impact Significance

Information in Sections 9.3 and 9.4 have been combined to develop a matrix of potential impact significance of different flood control facilities in each land use category (Table 9-4). This information, along with information in Tables 9-2 and 9-3 should be consulted in a preliminary review of specific facilities proposals.

9.5 COMPARISON OF ENVIRONMENTAL EFFECTS OF FLOOD CONTROL ALTERNATIVES

The All Conveyance and Detention/Conveyance alternatives differ as follows: The Detention/Conveyance alternative includes varying sizes of detention basins in the upstream reaches of the watercourses to regulate peak flows in downstream urbanized areas. As a result, the Detention/Conveyance alternative requires narrower flood channels, box culverts, pipelines, and bridges to carry flood flows.

With respect to land use and recreation resources, the Detention/Conveyance alternative would have generally greater levels of impact than the All Conveyance alternative due to the areal extent of the basins, where the basins are located in areas of land use impact. Because the major detention basins are located in currently undeveloped area, adverse impacts associated with these structures is not considered significant. Potential beneficial impacts associated with the possible use of detention facilities as a recreational resource would be substantial in the case of the Detention/Conveyance alternative. The relative impacts of conveyance structures would be lower for the Detention/Conveyance alternative as a result of the narrower rights-of-way required for these facilities in this alternative. The Detention/Conveyance alternative also offers greater opportunities for the use of floodways as a recreational resource (such as bicycle, equestrian, or hiking trails) than that associated with the All Conveyance alternative, but the greater land area required for detention basins would preclude other land development in those areas. Overall, the total amount of developable land appears to be greater with the All Conveyance alternative, but the major land requirements of the Detention/Conveyance alternative are associated with detention basins in undeveloped outlying areas and floodways associated with major

11.1.7.3 Water

The water sources for Clark County are Lake Mead and public and private wells. Most of the water from Lake Mead is provided through the Southern Nevada Water System which is jointly owned by the State of Nevada and the federal government. The Bureau of Reclamation, in cooperation with the Colorado River Commission, designed and developed the Robert B. Griffith Water Project, and the Colorado River Commission designed and developed the Alfred Merritt Smith Water Treatment Facility, which together are known as the Southern Nevada Water System.

In 1987, approximately 157,000 acre feet or 52 percent of the ultimate contractual quantity of 299,000 acre fee was used. That amount could be increased in the future so deliveries could be made in low demand (winter) months to provide water to recharge the aquifer for later recovery or recovery in high demand months.

Contracting water users of the Southern Nevada Water System are the Las Vegas Valley Water District, Nellis Air Force Base, and the cities of North Las Vegas, Henderson, and Boulder City. Basic Management Inc. has a separate contract for water from Lake Mead. A breakdown of water currently delivered to the Las Vegas Valley from both systems is presented in Table 11-11.

Basic Management Inc. is an industrial park in Henderson. Approximately 11,000 acre feet of water was used in the park's industrial facility and in the City of Henderson in 1987. The Las Vegas Valley Water District serves major portions of the City of Las Vegas and other unincorporated areas in the Las Vegas Valley. The City of North Las Vegas serves itself, a small part of the City of Las Vegas, and a portion of the unincorporated areas of Clark County.

The second source of water in the valley is a number of private wells which pumped approximately 67,000 acre-feet/year in 1987. The Las Vegas Valley Water District pumped approximately 37,154 acre-feet of this water in 1987. Other users are Nellis Air Force Base and the cities of North Las Vegas, Henderson, and Boulder City. Since 1945, groundwater withdrawals have exceeded recharge. This continued overdraft has resulted in a general lowering of the water table and surface settlement in some areas of the County.

The daily per capita use of water in the Las Vegas Valley area is approximately 360 gallons (Braybrook, 1990).

11.1.7.4 Sewer

Collection

The incorporated cities in the Las Vegas Valley, as well as Nellis Air Force Base collect wastewater within their jurisdictions. Clark County Sanitation District collects wastewater in the majority of the serviced unincorporated area which is generally south of Sahara Avenue and east of Pecos Road (CCDCP, 1987). The City of Las Vegas collects wastewater from portions of the unincorporated areas north of Sahara Avenue and west of Highway 95, in addition to the incorporated area of the city.

Treatment

Individual treatment facilities are operated by the Clark County Sanitation District, and the cities of Las Vegas, Henderson, and Boulder City. Clark County Sanitation District treats wastewater from Nellis Air Force Base and services unincorporated portions of Clark County.

Revised Table 11-11

Water Use in the Las Vegas Valley

Water User	Acre-Feet/Year (1987)
BASIC MANAGEMENT, INC.	
Industries	7,365
Henderson	3,932
Total deliveries	11,297
Losses	1,348
Total diversion	12,645
SOUTHERN NEVADA WATER SYSTEM	
Las Vegas Valley Water District	130,196
Nellis Air Force Base	1,340
North Las Vegas	13,217
Henderson	12,326
Total deliveries	157,079
Losses	3,863
Total Diversion	160,942
LAS VEGAS VALLEY	
Deliveries to valley	168,376
Diversion from Lake Mead	173,587

Source: Colorado River Commission, 1990

12.2.1.2 Lake Mojave Period

The Lake Mojave Period ranges from approximately 10,000 to 7,500 B.P. This cultural complex/tool tradition is more prevalent in the desert areas of southern California than in the Las Vegas Valley. Controversy exists concerning the lifeways of these people. Bedwell (1973) and Hester (1973) contend that peoples of the Lake Mojave period were hunters and gatherers especially adapted to exploitation of lacustrine environments. Warren (1967) hypothesizes a generalized hunting, gathering, and fishing culture adapted to the ecological zones of the north-south trending mountain ranges (Warren et al., 1980). Artifacts characteristic of this period include a fairly generalized tool kit which includes Lake Mojave and Silver Lake points. Suisa (1964) reports these points on terraces of the Las Vegas wash near the Tule Springs site. Ecological characteristics of the Duck Creek area during the Lake Mojave period was especially suited to the generalized hunting, fishing, and gathering adaptations of the Lake Mojave peoples (Rafferty, 1984).

12.2.1.3 Archaic or Pinto-Gypsum Period

The Archaic or Pinto-Gypsum Period ranges from approximately 7,500 to 2,000 B.P. Initially artifacts found in the Gypsum Cave type site were thought to date to ages coincident with Pleistocene fauna (Harrington 1933). Radiocarbon dates from samples taken in association with artifacts recovered from the Gypsum Cave indicate that dates of 2900-2400 B.P. would be more accurate (Heizer and Berger 1970). Hauck et al., (1979) postulate a hiatus in human utilization of the Las Vegas Valley from circa 7,000-5,000 B.P. These dates are coincident with a period of extreme aridity in the area. Thus, the Archaic Period cultures would have not have existed until 5,500 B.P. It is probable that some population did exist during this arid period, however. Suisa (1964) and Warren and Crabtree (1986) place the beginnings of the Archaic as 6,000-7,000 B.P. Warren et al., (1980) define separate Pinto and Gypsum periods and note that the Pinto Period is poorly defined and is centered around the rather poorly defined Pinto Point tool type.

There is also much overlap in radiocarbon dates for projectile points characteristic of the Archaic. Humboldt points date from 5,900-3100 B.P.; Pinto points date from 5,350-2670 B.P.; while Gypsum points date from 3,790-2,450 B.P. (Heizer and Hester, 1978). Hauck et al., (1979) suggest a temporal but not spatial overlap of the Humboldt/Pinto and Gypsum complexes after about 5,000 B.P. Thus, it is possible that southern Nevada was inhabited by two different cultural groups although chronological and functional factors may account for the distribution. In the project area sites dating to the Archaic Period are found around Las Vegas Valley springs, in the Duck Creek region, mountain foothills, lower mountains and upper mountains. Milling stones are present in the Archaic tool assemblages. Peoples of that time exploited all available ecozones and types of food resource. Development of an economic pattern of seasonal transhumance is proposed by Bettinger and Baumhoff (1982).

Rafferty (1984) notes that dates for the appearance of the Elko point generally range around 4,000 B. P. and that the type disappears sometime between 920-650 B.P. Rafferty also cites ethnographic evidence that Elko "points" were knives in 1870 Utah. Citing the longevity of this tool type and the Paiute style settlement patterns noted by Aikens and Witherspoon (1982) in central Nevada he argues that the Numic speaking peoples may have been in Nevada for several thousand years. Thus, in Rafferty's view, the argument that Numic speaking peoples entered the Great Basin and displaced other peoples is not valid. Bettinger and Baumhoff (1982), utilizing linguistic evidence, assume the actuality of the Numic spread. They support their arguments by citing the differences in subsistence techniques between the pre-Numic and Numic populations as evidence that Numic speakers must have spread into the areas

New Mexico merchant Antonio Armijo was the first to bring his trading caravan into the Las Vegas Valley in 1830. Following the Las Vegas Wash, Armijo entered the valley at Whitney Mesa in the present-day Paradise Valley region (Roske, 1986). Armijo's trace did not become the regular route of the Old Spanish Trail, however. Later that same year the Wolfskill Yount party pioneered a variant of the route through the Needles area, while a northern fork of the trail was developed through the Las Vegas Springs in the 1830s (Roske, 1986).

John C. Fremont reached Las Vegas Springs via the northern variant of the Old Spanish Trail in 1844. His notes and maps were published the following year, popularizing the northern route of the trail through Las Vegas (Myhrer, 1987; Roske, 1986). The trading era along the Old Spanish Trail ended in 1848. However, travel through Las Vegas continued as the Mormon Road, linking Mormon headquarters in Salt Lake City with southern California, emerged from the route of the Old Spanish Trail (Pahrer, 1971). Portions of the Old Spanish Trail/Mormon Road have been recorded as significant historic archeological sites (Myhrer et al. 1990). These site sections are indicated on Map 12-2 and treated as historical resources in Section 12.3.3. below.

In 1855, Las Vegas was selected by Mormon leader Brigham Young as a settlement site. A party of Mormon missionaries arrived in the Las Vegas Springs area on June 14, 1855 and proceeded to establish a settlement four miles to the east (Roske, 1986). Construction of an adobe brick fort was initiated at the site, but was never completed. The unsuccessful mission was terminated in 1857 and the site abandoned by 1858.

Mining activity in the Las Vegas Valley was regenerated in 1861 when silver was discovered in an old Mormon lead mine southwest of Las Vegas. The mine was reopened and a smelter and mining camp established nearby named Potosi (Wright, no date). Many mines, such as the National Register eligible Frenchman Mine, were opened after this initial rediscovery of silver. During this time, ranching and farming activities also developed within the valley. The Las Vegas Springs area and the Old Las Vegas Mormon fort and adjoining lands were eventually acquired and developed into ranches by Octavius Decatur Gass in the 1860s and 1870s. Both ranches became the property of Archibald and Helen Stewart in 1881 (Roske, 1986). Mrs. Stewart continued ranch operations from 1884 to 1902 after her husband was murdered. In 1902 she sold the 1,800 acre Stewart Ranch to the San Pedro, Los Angeles, and Salt Lake Railroad. The Kiel (or Kyle) Ranch was established by Conrad Kiel in 1875, on land located north of the Old Mormon Fort which has once served as the Mormon Indian farm (Roske, 1986).

Las Vegas remained a quiet ranching region until 1905 when the San Pedro, Los Angles and Salt Lake Railroad was completed through the Old Las Vegas Ranch. The Las Vegas Land and Water Company, a subsidiary of the railroad, held a property auction on May 15, 1905, offering undeveloped lots for sale in "Clark's Las Vegas Townsite," (Wright, no date; Roske, 1986), an area which today is bounded by Stewart, Garces, Main and Fifth Streets.

In 1909, the new townsite experienced an additional spurt of growth when the railroad installed its main machine shops at the Las Vegas railroad facilities (Wright, no date; Charles Hall Page and Associates, 1978). On July 1, 1909, Las Vegas was named the county seat of the newly formed Clark County.

record forms designating historic sites, and various literature and cartographic sources. Literature sources include published primary and secondary sources on the history of the area. Cartographic sources include U.S. General Land Office (USGLO) survey plots and USGS topographic quadrangles. Individuals knowledgeable in the history of Clark County and the Las Vegas Valley were consulted, as was an existing database compiled by Dames & Moore.

The sensitivity of inventoried historical resources was rated on the basis of: 1) register status, 2) the quality of the physical remains that are known or likely to occur, and 3) the strength of the sites associations with persons and events important in local history. Those sites which appeared on the Nevada State Register and the National Register, or had been determined eligible for the National Register, were assigned a sensitivity level of "high." Sites which do not appear on the National Register or which have been determined as not eligible for the National Register were assessed using the following general criteria. Roads/trails and railroad grades were assessed as having moderate to low sensitivity, as were sites whose existence is somewhat questionable. Structures, townsites, ranchsites, and known areas of habitation were generally accorded a sensitivity rating of "moderate." Seventy historic resources were inventoried in the regional study area (Figure 12-2; Table 12-4).

12.3.3.1 Northern Las Vegas Valley

The inventory of the Northern Las Vegas Valley included the Tule Springs Ranch, a National Register Historic District, as well as four previously recorded historic sites which, according to archaeological site records, have been determined eligible to the National Register. One of these sites is the Frenchman Mine, which the BLM plans to use as an interpretive site. Portions of Las Vegas Wash are also included in this subarea, along with historic roads, railroad grades and sidings, mines, and mining districts, ranching areas, and a quarry.

12.3.3.2 Central Las Vegas Valley

The Central Las Vegas Valley subarea contains numerous National Register properties, including the Kyle Ranch, Las Vegas Mormon Fort, and the Las Vegas Springs historic site. Three additional National Register eligible sites are also included in the inventory for this region. Additional historic properties include the Eglington ranch site, the Las Vegas Union Pacific Railroad Yards, a railroad underpass, and several historic roads.

12.3.3.3 Southwest Las Vegas Valley

Inventoried sites within Southwest Las Vegas Valley cover a variety of historic themes and include historic roads and railroad grades, ranch sites and railroad stops, mine sites, pipelines, and a historic airfield. A portion of Las Vegas Wash, which encompassed Armijo's trace, has been included. There is one National Register site within this subarea: Sandstone Ranch, also known as Spring Mountain Ranch, is a National Register Historic District consisting of ranch structures dating from late 1860s. It is currently being used by the Nevada State Park System for interpretive purposes and as a visitor's center. A section of the Old Spanish Trail/Mormon Road located within this area has been determined eligible for inclusion on the National Register (Myhrer et al. 1990).

12.3.3.4 Boulder City

The Boulder City subarea contains three National Register sites: the Old Boulder City Hospital, Boulder Dam Hotel, and the Boulder City Historic District. Additional historic sites include roads, McKeeversville site, and the abandoned grade of the U.S. Government Railroad, which was constructed

Assuming that an adequate mitigation program is carried out on flood control projects on private as well as federal land, the No Project alternative would not necessarily reduce impacts overall. Rather, the extra protection afforded resources on private land by virtue of the projects NHPA compliance efforts could actually have a positive benefit to cultural resource preservation.

12.6 PROGRAMMATIC MITIGATIONS

Mitigation of impacts to cultural resources will be achieved through the NHPA Section 106 consultation process as described in 36 CFR 800. BLM in its role as lead federal agency will consult with the State Historic Preservation Officer (SHPO) to determine compliance requirements. The District and Corps of Engineers (COE) will also be consulted, the latter as a cooperating agency. These consultations have been initiated and will continue as needed throughout the course of the project.

12.6.1 Archaeological Resources

The BLM, Stateline Resource Area (SRA), Las Vegas District, Nevada, as part of writing a Resource Management Plan, carried out a cultural resources inventory for the SRA. Myhrer (1990) divided the SRA into 19 geographic zones and rated each geographic zone for cultural resources sensitivity. Three archaeological sensitivity levels, high, moderate, and low, were designated. Zones with high sensitivity are those possessing abundant supplies of water and plant food, or are those that possess suitable habitat for faunal resources. High sensitivity zones were further divided into those that have not received inventory adequate to determine the sensitivity of all areas within the zone and those which have received a sufficient amount of inventory. Moderate sensitivity zones are designated as those areas which do not contain large supplies of water and edible resources but which have not been surveyed sufficiently to adequately document the density of cultural resources, or to delimit any areas of high sensitivity within the zone. Low sensitivity zones are those which have received sufficient inventory to "indicate that the finding of additional significant sites through further field survey is highly unlikely". (Myhrer 1990:26). Myhrer notes that within these low sensitivity zones there are known sensitive areas and sites that should be managed for information and conservation uses.

One of the two BLM low sensitivity zones is the Las Vegas Valley, which includes the area encompassed by the CCFCD project. Within the Las Vegas Valley Zone the BLM designated two areas of high sensitivity, the Eglington Escarpment area and the Duck Creek area. Dames & Moore, as part of this study, has carried out a sensitivity analysis of the project area (see Section 12-3 and Figure 12-1). As a result of this analysis, the Upper Las Vegas Wash was added to the list of areas that possess high sensitivity. Cultural resources inventories are generally guided by recognition of sensitivity areas designated by BLM and Dames & Moore, and by the understanding that these areas lie within an overall zone of low sensitivity that has received relatively intense cultural resources survey in the past.

Following the recommendations of the BLM, a Class III pedestrian survey for cultural resources will be conducted on all lands within an Area of Potential Effect (APE), excluding areas that have been previously surveyed and subjected to Section 106 consultation or that have been impacted by urban development. An archaeological survey and Section 106 consultation shall be completed in advance of approval of rights-of-way.

Following completion of the inventory, the BLM would consult with the SHPO to determine whether any resources qualify as eligible for the National Register of Historic Places. Assessing the potential eligibility may require subsurface testing or other fieldwork; if so, the District should retain a qualified archaeologist and/or historian to conduct the work and make recommendations regarding significance. If resources are found to be eligible for the National Register, the District will develop a treatment plan for BLM which will be used during consultation with COE, SHPO, and ACHP. In developing treatment plans District will attempt to avoid impacts wherever feasible. If avoidance is not feasible, data recovery or other appropriate mitigation measures will be proposed. The treatment plan will also address measures to be taken should potentially significant resources be unexpectedly encountered during construction.

12.6.2 Ethnographic Resources

Although no impacts to specific ethnographic resources have been identified, Native American groups have expressed general concerns for cultural resources in the project area. Consequently, continued communication with appropriate Native American groups will be maintained throughout the environmental review process and Section 106 consultation process. Based on the contact program reported herein, it would be appropriate to address subsequent communication regarding the cultural resources component of the Master Plan to the Las Vegas and Moapa Paiute with copies to the Southern Paiute Chairman's Association. These three entities will also receive copies of the EIS.

During the cultural resources survey phase of the project, Paiute Elders will be notified of specific facility proposals. Involvement of Paiute representatives in the field reconnaissance surveys will be based upon their project-specific comments and direction from the SHPO.

12.6.3 Historic Resources

An integral part of the examination of areas of potential effect should be an updated register search. Historic archaeological sites identified through the archaeological records search should be included in this inventory.

Prior to the archaeological survey, a search of primary historic documents, including, but not limited to early USGS quadrangle maps, USGLO survey maps, and county road maps will be conducted to assess the location of potential historic sites. These will be included in the updated inventory of historic resources.

Concurrent with the archaeological survey, potentially significant historic resources will be revisited in the field to assess their current condition. This work will be completed in accordance with requirements set forth during Section 106 consultation and provide information requested by SHPO to assess potential impacts and determine an appropriate treatment plan.

TABLE 12-4 (continued)

TABLE 12-4 (continued)

HISTORIC RESOURCES INVENTORY

Identification Number	Site Number	Site Name	Site Type	Sensitivity	Comments
28		Las Vegas Wash Paradise Valley Duck Creek	Historic Trail/ Historic Ranches, Farms, Springs	Moderate	Sites of several historic ranches, farms, and springs are located in this region. Carpenter, 1915; Ritenour and Tipton, 1978 Site of Armijo's trace; Roske, 1986
29		Old Road Callville - St. Thomas	Historic Road	Low	USGLO 1883, 1933
30		Old Road	Historic Road	Low	USGLO 1933
31		Old Road from Las Vegas to El Dorado Canyon	Historic Road	Low	USGLO 1881, 1883
32		Old Road from Las Vegas to Ivanpah	Historic Road	Low	USGLO 1881
33a,b		Old Arrowhead Trail	Historic Road	Moderate	a) USGLO 1935 b) Ritenour and Tipton, 1978; Roske, 1986
34		Old Emigrant Road from Salt Lake to San Bernardino/Road to Ivanpah	Historic Road	Moderate	USGLO 1882, 1881
35		Old Road to El Dorado Canyon	Historic Road	Low	USGLO 1881
36		Road from Ash Meadows to El Dorado Canyon	Historic Road	Low	USGLO 1882
37		Old Road	Historic Road	Low	USGLO 1881
38		Old Road from Las Vegas to Resting Springs	Historic Road	Low	USGLO 1881
38a	26-CK-3848	Mormon Road Historic Trail Segment	Historic Road/ Trail Section	High	Myhrer, 1987, Myhrer et al. 1990, IMACS Site Form, Agency No. BLM 53-4969
38b	26-CK-3848	Old Spanish Trail/ Mormon Road	Historic Road/ Trail Section	High	Myhrer et al. 1990, NSO publication Technical Report No. 17

TABLE 12-4 (continued)

TABLE 12-4 (continued)

HISTORIC RESOURCES INVENTORY

Identification Number	Number	Site Site Name	Site Type	Sensitivity	Comments
52	26-CK-3917	Boulder City Historic District	National Register Historic District	High	Roughly bounded by Nevada Highway, Avenue L, Date Street, and 5th Street
53		Las Vegas Union Pacific Railroad Yards	Railroad Yards	Moderate	Charles Hall Page and Assoc., Inc. 1978; see also Railroad Storehouse Building (#11)
54		Rockwell Field	Historic Airport	Moderate	Ritenour and Tipton, 1978; Roske 1986:69-70
55		Frenchman Mine South Nevada Gold Mining Co. Mine and Mill/Boarding Houses and Cottages	Historic Mine Site	High	Ritenour and Tipton, 1978
56		Old Road	Historic Road	Low	USGS 15' Quad, Las Vegas, 1908
57		Railroad Pass	Historic Railroad Pass	Moderate	Ritenour and Tipton, 1978; Myrick, 1963
58		Marble Quarry	Historic Quarry	Low	Carpenter, 1915
59		McGiff Ranch	Historic Ranchsite	Moderate	Ritenour and Tipton, 1978
60		Gilcrease Ranch	Historic Ranchsite	Moderate	Ritenour and Tipton, 1978
61		Gilcrease Vineyard	Historic Vineyard	Moderate	Ritenour and Tipton, 1978
62		Dugout Ranch	Historic Ranchsite	Low	Ritenour and Tipton, 1978
63		Blue Diamond Adobe	Historic Site	Moderate	Ritenour and Tipton, 1978
64		Cottonwood Springs	Historic Site	Low	Ritenour and Tipton, 1978
65		Cottonwood Ranch	Historic Site	Moderate	Ritenour and Tipton, 1978
66		Blue Diamond Mine	Historic Site	Moderate	Ritenour and Tipton, 1978

13.2.2.4 City of Henderson

The city of handerson covers approximately 81 square miles of land, 72 of which are incorporated. The area has become a regional center for industry and warehousing, and is currently experiencing extremely rapid residential and commercial growth. No more large planned communities can be developed in the area without annexation. Major projects currently under development include Cosmo World/Silver Springs, Green Valley, Lake at Las Vegas, McDonald Ranch, and Whitney Ranch.

13.2.2.5 Boulder City

Boulder City covers an estimated 35 miles of land, all of which is incorporated. Although host to numerous visitors en-route to Lake Mead, Hoover Dam and other local recreation areas; the City's land use is principally driven by it's right-of-way and easement agreements for Hoover Dam's power transmission lines. Local growth ordinances recently adopted by the City restrict residential growth to four percent a year. Only 132 residential building permits are issued annually.

13.2.2.6 Nellis Air Force Base

The total occupational range of the Nellis Air Force Base is 3,012,369 acres; the Base itself occupies 11,193 acres. With a work force of an estimated 12,298 persons, the Base contains approximately 5,810,640 square feet of permanent or semi-permanent buildings, including 1,364 residential units. The Nellis long-range Facility Improvement Plan (Nellis Air Force Base, 1989) includes numerous projects to construct, upgrade and repair facilities through the year 2,000; none of these projects include development of residential areas. There are no areas of the Base that cannot be developed due to flooding.

13.2.3 Permitted and Presumed-to-be-Permitted Projects

Clark County is experiencing unprecedented growth, particularly in the Las Vegas Valley area. The growth is driven by the current boom in construction for the hotel/gaming industry, resulting in over 4,000 new residents monthly.

Aggressive residential development is currently occurring in many areas of the Valley, much of which is associated with relatively large, privately owned master-planned communities. As a result, master planning on a valley-wide scale is virtually impossible, and the public services sector has been forced to operate largely in a reactive mode to accommodate both the rate and spread of these developments. One large constraint to valley-wide planning is the lack of large tracts of privately owned land within the area. Approximately 50 percent of the Las Vegas Valley is owned by the Federal Government, which exerts significant influence on the location, type and timing of future growth. (Dames & Moore, 1990)

More than 150 residential developments are known to be permitted and currently under construction in the Valley area; collectively they represent 144,700 dwelling units. Additionally, there are an estimated 155 residential developments which have been, proposed. A summary of permitted and presumed-to-be-permitted master residential plans greater than 160 acres are presented in Table 13-1 and illustrated on Figure 13-1.

13.3 Long-Term Cumulative Impacts of the Flood Control Master Plan and Regional Growth

Considering total development in the Valley in terms of both current and proposed projects, the primary affected resources include: air quality, biological resources, visual resources, and cultural resources.

Of potential concern is the indirect cumulative effect of regional growth accommodated by the implementation of a regional flood control program. Because growth in the Las Vegas Valley has not been constrained by the lack of such a program in the recent past, this cumulative effect is not considered a significant impact of the flood control program itself. Continued growth does represent a potentially significant cumulative air quality issue in the study area, however. A consideration of the potential effect of different flood control alternatives on the pattern of regional growth is important as far as the comparison of different alternatives.

13.3.2 Geology

Potential cumulative impacts of the Detention/Conveyance alternative could include the loss of significant volumes of mineral resources (sand and gravel) due to the proposed use of several gravel pit areas as detention basins. Should the current rate of new construction be sustained, the limited sand and gravel resources will become more economically important. Use of existing or potential gravel pits as detention facilities will result in a loss of those pits as viable resources. This will increase the potential value of remaining pits and the importance of locating new pits, as current resource areas are converted to detention basins. It is anticipated that these sand/gravel losses will not significantly impact the overall rate of growth in the Valley although material shortages may result in price increases as local resources become more scarce.

The cumulative effect of the Detention/Conveyance alternative will be to decrease peak flows throughout much of the area. This would decrease the potential for erosion in unlined channels. In addition, the detention basins and lining of unlined channels will remove much of the sediment load which is currently transported and deposited downstream. This would increase the potential for erosion of unlined portions of channels and at discharge points to lower Las Vegas Wash. It is likely that the lower discharge rate would have a greater effect than the decreased sediment load on erosion potential.

Peak flows estimated in the Master Plan for the All Conveyance alternative are generally similar to or less than the existing flow conditions. However, at some locations, peak flows are increased by this alternative. Under existing conditions most channels are unlined. In as much as most channels will be lined under this alternative less sediments will be transported downstream. Because the erosive potential of clean water is higher than that of sediment laden water, unlined portions of channels and the Lower Las Vegas Wash would suffer increased erosion.

13.3.3 Ground Water

Potential cumulative effects on ground water associated with the future development of the Las Vegas Valley could include localized increases in shallow ground water associated with increased landscape watering and urban runoff. Because shallow ground water in the Las Vegas Valley is generally of poor quality, these increases could result in some degradation of water quality in deeper aquifers if the resulting head pressure causes an increased downward percolation to deeper aquifers used to supplement local water supplies. Both the Detention/Conveyance and the All Conveyance alternatives could contribute to potential cumulative effects on ground water quality of the principal aquifers. This effect could occur as a result of shallow ground water level increases associated with the widespread introduction of lined channels and pipelines in channels currently allowing ground water discharge into natural channels. This impact could be significant unless facility-specific mitigation described in Section 6.6.2 is implemented. With the application of these measures, residual impacts associated with flood control facilities are expected to be less than significant and would not contribute to this potential cumulative impact.

On October 17, 1989, the Las Vegas Valley Water District filed 146 applications for unappropriated public waters of Nevada. These applications were filed for water supplies located in 28 groundwater basins throughout Clark, Lincoln, White Pine, and Nye counties. These basins will be a major component of the Water District's Cooperative Water project - an overall water supply strategy for Southern Nevada which also includes water conservation, groundwater recharge via direct well injection, and wastewater reuse (water reclamation).

These filings do not involve groundwater basins which occur within the area affected by the District's 10-year Plan facilities for the Las Vegas Valley. As such, there is no direct relationship between these water filings and the flood control program. The Water District's Cooperative Water Project is designed to accommodate the Valley's projected growth over the next 20 years. This growth will prompt further actions over time by the Flood Control District to provide comparable levels of protection in newly developing areas and to ensure continued adequate protection for established developments. The increased level and scope of protection afforded by such future flood control facilities will act to stabilize flood hazard potential in the Valley and ensure that newly developed areas do not experience unnecessary loss of lives and property due to such hazards.

13.3.4 Surface Water

Urban growth within the study area would increase the area of impermeable surfaces and could increase surface water runoff conveyed by natural drainage systems and flood control structures. This flow increase, and the presence of increased urban populations would expose greater numbers of people to safety hazards and property losses associated with flood events. Increased flows could also result in increased erosion in wash channels, especially sensitive areas such as the Lower Las Vegas Wash. Increased sediment loads could degrade surface water quality, and may increase the volume of sediment transported to Lake Mead. The implementation of the Master Plan, including the proposed 10-year construction plan, is expected to reduce public safety hazard by efficiently conveying flows. Although flood control facilities could result in increased sediment loads and increased erosion in localized areas during facility construction and early stages of flood control system development, attention to controlling flow velocities, and establishing erosion control facilities in areas of identified erosion problems during facility design is expected to mitigate these effects. Although cumulative surface water impacts may be considered potentially significant, the proposed flood control facilities are not expected to contribute to these impacts and may partially mitigate potential adverse effects. The most significant effect of the proposed flood control facilities is the beneficial reduction of public safety hazards.

13.3.5 Biological Resources

Implementation of either the Detention/Conveyance or All Conveyance alternative would cause the loss or disturbance of wetland vegetation and various wildlife habitat throughout a 250-square-mile region. Although these impacts would occur in scattered, disjunct portions of the region, there will be a cumulative effect because the same biological resources will be affected throughout the region wetland habitats and sensitive wildlife species. One example of cumulative impacts to the latter resource is the potential fragmentation of desert tortoise habitat due to installation of large, linear flood control facilities that represent barriers to tortoise movement. Potentially significant cumulative impact can be mitigated by conducting a construction monitoring program to reduce direct impacts to tortoises, by the

NEW SUBSECTION: TO BE ADDED TO SECTION 13 OF DEIS

13.4 CUMULATIVE IMPACTS ASSOCIATED WITH THE 10-YEAR FLOOD CONTROL PLAN

13.4.1 Analysis Methodology

The analysis of potential cumulative impacts associated with the 10-year flood control construction program is focused on the coincident construction of flood control projects and other planned projects within the study area, and the combination of changes in the urban/rural structure of the Las Vegas Valley and related activity associated with the flood control projects and urban growth. To focus this analysis on topics which may be affected by the impacts of the flood control facilities, and to address those impacts which may represent cumulative issues involving additive effects of multiple activities, a three-step process has been employed in this analysis. This three step process involves:

1) Consideration of potential impacts of 10-year plan facilities. If no effect, or negligible effects are anticipated with respect to a specific resource or environmental issue, then the implementation of the 10-year plan will not materially contribute to cumulative effects related to this resource or issue, and no further analysis is required. If potential impacts are noted (including less than significant impacts in many cases), the second step of this analysis is required.

2) Consideration of potential impacts of identified development expected to occur during the 10 year construction plan time frame. If no common or overlapping impacts occur to the resources or issues identified in step 1, then no further analysis is necessary. If impacts are identified that could combine with impacts associated with the 10 year plan facilities, these impacts will be addressed in step 3.

3) Full analysis of potential cumulative effects. This step involves the analysis of the nature of impacts and their magnitude, geographic extent, and potential time frame to identify potential overlapping effects and other cumulative impact issues. The potential for a combination of effects to result in significant cumulative impacts even though individual impacts may be less than significant is specifically addressed in this analysis.

In addition to the consideration of the 10-year plan facilities and the potential impacts identified in Section 15 of this EIS, the projects identified in Table 13-1 and current community growth rate presented in Section 11.1 were used to identify other developments or conditions in the study area that may contribute to cumulative impacts. This information was evaluated as it relates to each specific environmental consideration, and the results of the three-step analysis process is presented in the following subsections of this EIS.

13.4.2 Air Quality

As indicated in Section 15.2 of the EIS, the particulate matter emissions associated with flood control facility construction is considered potentially significant. Review of the developments identified in Table 13-1 suggests that particulate matter emissions would also be associated with these developments (as a result of land clearing), and so this topic is specifically addressed in accordance with step 3 of the cumulative analysis procedure. In addition, the construction of 10-year plan facilities will result in carbon monoxide emissions that may combine with carbon monoxide emissions from increased vehicular traffic associated with urban growth. This cumulative effect will also be addressed in accordance with step 3 of the cumulative analysis procedure.

13.4.2.1 Cumulative Particulate Matter Emissions

The particulate matter emissions levels associated with individual facilities are listed in Table 15-1. Emissions factors developed by the Environmental Protection Agency (1975) were used to estimate emissions associated with land clearing and grading activities associated with major land development projects expected to occur during the 10-year plan construction period. For the purpose of this analysis, flood control projects are assumed to be completed during the year specified as the first year of construction, and land development projects are assumed to be completed during the expected buildout year unless a specific time frame for phased construction is indicated in the notes presented on Table 13-1. This is expected to conservatively overestimate the total particulate matter emissions associated with each year by compressing multiple-year construction activities into a single year's total. The overall results of this analysis are presented in Table 13-2. As indicated in this table, cumulative particulate matter emissions associated with proposed projects are substantial, and would add approximately 10 percent to nearly 20 percent of the Clark County 1979 inventory of total particulate matter emissions. As the Table 13-2 results indicate, particulate matter emissions associated with flood control facilities represent less than 2 percent of the total projected land development emissions, and so do not represent a major component of the cumulative total.

Although flood control facility construction associated with the 10-year plan is not considered a major component of the cumulative total, mitigation of potential overlapping effects is considered appropriate to address the cumulative impact of concurrent development because particulate matter standards are already exceeded in the Las Vegas Valley. In addition to the mitigation measures suggested in Section 4.6.2, construction schedules should be managed to restrict concurrent multiple earth moving activities within 1000 feet of one another on days with wind speeds in excess of 15 miles per hour.

13.4.2.2 Cumulative Carbon Monoxide Emissions

The carbon monoxide emissions levels associated with individual flood control facilities are listed in Table 15-1. Emissions associated with major land development projects expected to occur during the 10-year plan construction period are estimated using the composite emissions rates presented in Table 14-1 for detention basin construction. The same assumptions addressing flood control and land development construction schedules addressed in Section 13.4.2.1 are used in this analysis. The overall results of this analysis are presented in Table 13-3. As indicated by comparison of these results to the overall Clark County carbon monoxide emissions inventory (Table 4-6), cumulative carbon monoxide emissions associated with facility construction represent a minor component (less than one percent) of the total Clark County emissions for this pollutant.

As indicated in Table 4-6, the principal sources of carbon monoxide emissions are on-road vehicles. As urban growth continues in the Las Vegas Valley, emissions associated with this source are expected to increase proportionately. As a result, both the area affected by carbon monoxide levels in excess of ambient air quality standards is expected to increase, and the number of days of standard exceedances will likely increase. The overall cumulative effects of this growth is significant. Because flood control facility construction would not materially contribute to this cumulative effect, mitigation measures addressing flood control facilities cannot effectively reduce cumulative impacts, and none are recommended.

TABLE 13-2

CUMULATIVE PARTICULATE MATTER EMISSIONS 10-YEAR FLOOD CONTROL CONSTRUCTION PLAN

Development Year	Land Development			Flood Control		Total Emissions	
		Emissions					
	Acres[1]	lb/day	tons/yr	lb/day	tons/yr	lb/day	tons/yr
1991	4870	44953.8	5844.0	846.1	138.2	45799.9	5982.2
1992	7057	65141.5	8468.4	274.4	17.2	65415.9	8485.6
1993	5412	49956.9	6494.4	675.0	79.8	50631.9	6574.2
1994	4193	38704.6	5031.6	13.0	0.1	38717.6	5031.7
1995	5030	46430.8	6036.0	108.8	1.5	46539.6	6037.5
1996	4193	38704.6	5031.6	432.7	25.8	39137.3	5057.3
1997	4193	38704.6	5031.6	318.2	5.0	39022.8	5036.6
1998[2]	2782	25680.0	3338.4	—	—	25680.0	3338.4
1999[2]	2510	23169.2	3012.0	—	—	23169.2	3012.0
2000[2]	2510	23169.2	3012.0	—	—	23169.2	3012.0

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[1] Land development acreage is based on information in Table 13-1. For major projects with extended buildout periods, average annual acreage is used assuming construction begins in 1991 and continues to the buildout year. Developments addressed in this manner include Peccole Ranch, Summerlin, Spring Valley, Stone Gate, Sunrise Valley, Nevada Springs, North Las Vegas BLM Land Transfer, Eldorado, Green Valley, Lake at Las Vegas, and Cosmo World. Other developments are assumed to be constructed entirely during the buildout year. Emissions factor is 1.2 tons/acre/month based on EPA AP-42 Section 11.2.4.3 and assumes land clearing occurs progressively over a 12 month period. Daily emissions assume 260 working days per year.

[2] Flood control projects scheduled for construction starts in 1998 through 2000 are not presently identified, and emissions cannot be predicted for these years.

TABLE 13-3

CUMULATIVE CONSTRUCTION-RELATED CARBON MONOXIDE EMISSIONS 10-YEAR FLOOD CONTROL CONSTRUCTION PLAN

Development Year	Land Development			Flood Control		Total Emissions	
		Emissions[2]					
	Acres[1]	lb/hr	lb/8hr	lb/hr	lb/8hr	lb/hr	lb/8hr
1991	4870	561.9	4495	237.9	1903	799.8	6398
1992	7057	814.3	6514	141.2	1130	955.5	7644
1993	5412	624.5	4996	87.7	702	712.2	5698
1994	4193	483.8	3870	3.1	25	486.9	389.5
1995	5030	580.4	4643	40.8	326	621.2	4969
1996	4193	483.8	3870	75.6	605	524.4	4195
1997	4193	483.8	3870	40.6	325	524.4	4195
1998[3]	2782	321.0	2568	—	—	321.0	2568
1999[3]	2510	289.6	2317	—	—	289.6	2317
2000[3]	2510	289.6	2317	—	—	289.6	2317

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[1] Land development acreage was determined as described in footnote 1 in Table 13-2.

[2] Land development CO emissions are based on a composite emissions factor of 240 lb/acre developed in an 8-hour day derived from the daily emissions rate associated with detention basin construction in Table 14-1. Hourly emissions are assumed to be an average hourly rate. Annual work schedules assume construction occurs 260 days per year.

[3] Flood control projects scheduled for construction starts in 1998 through 2000 are not presently identified, and emissions cannot be predicted for these years.

13.4.3 Geology

While the proposed flood control facilities would be subject to damage from geologic hazards, the project, with incorporation of the recommended mitigation measures, is not expected to significantly contribute to geologically hazardous conditions. Construction related potential impacts may include increased wind erosion from the disturbance of surficial soils, or water erosion in the event of a rainstorm during construction. These impacts can be readily mitigated through the use of water or chemical dust suppressants, compaction and revegetation of the disturbed area immediately following construction, and the scheduling of construction to avoid periods of potential rainfall.

Potentially significant impacts associated with project operation include modification of erosion and deposition patterns in off-site areas, which could subsequently result in increased slope instability in these off-site areas. Like the identified construction impacts, these operational impacts can be reduced to not significant levels through the implementation of appropriate mitigation such as erosion control and/or stability measures. As indicated in Section 15.3, seven facilities would potentially affect mineral resource operations. These facilities should either be relocated or fair compensation should be offered to the mineral extraction operators for relinquishment of valid claims.

The residual impacts on geology and soils are not anticipated to be significant, therefore the proposed project would not contribute to overall cumulative effects on geology and soils associated with concurrent or future project plans in the Las Vegas Valley.

13.4.4 Ground Water

As discussed in Section 15.4, potentially significant impacts on ground water levels may result from lining channels and washes which could restrict discharge of ground water from the shallow aquifer causing increased water levels within the shallow aquifer in the vicinity of the lined channels. Areas of known shallow ground water are presented in Table 15-5. This increase in shallow aquifer water levels could possibly result in secondary impacts such as geotechnical problems including damage to foundations or seepage into subsurface structures, damage to root systems in landscaped areas, and increased potential for discharge of poor quality shallow ground water to underlying aquifers. However, these potential impacts can be reduced to not significant levels through implementation of mitigation based on results of site-specific investigations. Mitigation may include resiting a facility to an area where such impacts will not occur, or designing lining to allow discharge to occur through use of weep holes or drainage blankets. The 10-year plan facilities would not affect any areas identified as recharge to the producing aquifer in the Las Vegas Valley ground water basin.

Because potentially significant ground water impacts can be reduced to not significant levels, the proposed project would not contribute to overall cumulative effects on ground water associated with other concurrent or future project plans in the Las Vegas Valley.

13.4.5 Surface Water

Flood Control facilities are designed to collect, control, and direct surface water flows. Under normal flow conditions, the conveyance-detention facilities proposed in the 10-year construction plan are not expected to substantially affect the pattern or intensity of surface water flows. Under flood conditions, these facilities are designed to intercept surface flows and divert them to detention basins, and then to release these flows over an extended period of time (24 to 48 hours) into improved channels and floodways. This system is designed to convey flood flows through developed areas in a controlled manner. This operational effect of the 10-year plan facilities represents a significant change in the pattern and intensity of surface water flows under flood conditions. Table 15-6 lists the peak flow rate in cubic feet per second associated with discharge points of the proposed 10-year plan facilities, and compares these flow rates to the flows which would occur under the same flood conditions without these facilities. As indicated in this table, peak flow rates would not be increased at any outfall location as a result of the 10-year plan facilities' operation (and would be substantially reduced at most locations).

One concern regarding the cumulative impact of flood control facilities and future land development involves the effect of new impermeable surfaces (roadways, parking lots, buildings, etc.) on surface water runoff volumes. The extensive land development listed in Table 13-1 is expected to substantially increase the area of impermeable surfaces and resulting surface water runoff volumes. To address this effect, the peak flow rates presented in Table 15-6 assume that the entire area draining into the flood control facilities upstream of outfall locations has been developed. By considering these areas as already developed in the flood control system design, the cumulative effect of future land development has been incorporated into the 10-year plan facility designs. As a result, the cumulative effect of the 10-year flood control plan facilities and anticipated land development is an improved flood protection of areas adjacent to and downstream of facility locations. This is considered a beneficial impact.

13.4.6 Biological Resources

13.4.6.1 Desert Tortoise

Nature of Impacts due to Ten-Year Plan Facilities

Impacts to the desert tortoise due to construction and operation of the ten-year plan facilities will include direct and indirect impacts. Direct impacts will include displacement and loss of individuals, as well as removal of habitat. Not all habitat removal will be permanent. Temporary habitat loss will be associated with vehicle access, staging areas, and stockpile areas. It is anticipated that these areas of temporary disturbance will recover following construction of facilities.

Potential indirect impacts will include primarily habitat fragmentation and possible decrease in vigor or degredation of downgradient habitat due to diversion of runoff water. Both of these potential impacts will be associated with linear facilities, such as dikes and channels.

Direct and indirect impacts to tortoises have been described in the Biological Opinion prepared by the U.S. Fish & Wildlife Service (and included in this FEIS finalizing addendum). The Biological Opinion also includes discussion of mitigation measures, including removal of tortoises prior to construction, compensation for loss of habitat, and potential installation of tortoise walkways across linear facilities to reduce habitat fragmentation.

Other Major Activities with Impacts

Clark County is currently experiencing dramatic increases in urban and residential development. According to the short-term Habitat Construction Plan prepared by RECON, Clark County's population increased from 463,100 in 1980 to 761,279 in 1990, a 64 percent increase. In anticipation of continued growth, a number of large-scale residential developments are in progress or will commence soon. Those likely to affect tortoise habitat include the following:

Development	General Quality Level of Tortoise Habitat	Acres to be Removed by 2000
Angel Park	Low	640
Los Prados	Unsuitable to low	433
Painted Desert	Low	462
Summerlin	Moderate to very high	4,992
Rancho Las Palmas	Low	586
BLM ("3400")	Low	7,500
Eldorado	Low	3,400
Pecos Ranch	Low	320
Green Valley	Low to moderate	8,400
Lake Las Vegas	Low to moderate	2,445
Silver Canyon/Cosmo World	Low to moderate	11,288
Total for listed developments		40,466

Cumulative Impacts due to Flood Control Facilities

The facilities associated with the Clark County Regional Flood Control District (CCRFCD) Ten-year plan are primarily growth-accommodating rather than growth-inducing. As such, much of the disturbance due to construction and maintenance of flood control facilities will be within or adjacent to already disturbed areas. In addition, future land developments not currently identified may be proposed and constructed prior to 2000.

Proposed flood control facilities in the ten-year plan that occur within tortoise habitat, but not adjacent to currently identified residential developments will result in an estimated 812 acres of permanent disturbance. Of that total, 237 acres of disturbance will be in high or very high quality habitat, and 575 acres would be in moderate, low, or very low quality habitat. The 812 acres of permanent disturbance represents a small incremental increase in cumulative impacts, and is equivalent to only two percent of the previously identified 40,466 acres of disturbance to tortoise habitat due to residential development. Considering the growth rate in Clark County, it is anticipated that a portion of the 812 acres will be disturbed by additional residential development prior to construction of flood control facilities.

With implementation of mitigation measures identified in biological opinions, such as that for Biological Opinion for CCRFCD, as well as those identified in the Habitat Conservation Plan process, the continued existence of the desert tortoise is not expected to be jeopardized by cumulative impacts in Clark County.

13.4.6.2 Wetlands

Nature of Impacts due to Ten-year Plan Facilities

Impacts to wetlands due to construction and operation of the ten-year plan facilities will include adverse and beneficial effects. Direct adverse impacts will be permanent removal of wetlands, including Mojave wash scrub, herbaceous wetlands, cottonwood-willow woodland, and tamarisk scrub.

In addition, there will be potential indirect impacts, such as effects on desert wash scrub due to diversion of runoff by dikes.

The resultant changes in the hydrologic regime could cause adverse or beneficial impacts. If dramatic increases in flow velocities and volumes were to occur in established wetland areas, this could cause losses in wetlands due to scour and erosion. The facilities included in the ten year plan will not result in increased flows at facility discharge locations, however, so this impact is not expected to occur. A reduction in peak flows due to increased detention capacities would potentially allow reestablishment of emergent and aquatic vegetation in large areas such as the Las Vegas Wash.

Other Major Activities with Impacts

Clark County is currently experiencing rapid growth, including expansion in urban and residential development. As a result of the rapid expansion, areas of wetlands along several large washes, such as Flamingo and Tropicana, have been reduced in size and quality, and have become fragmented. Proximity to residential and urban areas has been accompanied by wetland habitat disturbance due to human-caused activities, including off-road vehicle use and trash dumping in washes.

In addition, increases in urban and residential developments have resulted in more runoff from precipitation events, and increased mean daily flows. The added runoff has, in turn, caused erosion and degradation of wetland habitat in the lower Las Vegas Wash, including increased down-cutting of wash channels.

Cumulative Impacts due to Flood Control Facilities

The construction and operation of CCRFCD ten-year plan facilities is primarily growth-accommodating, rather than growth-inducing. Those construction and operation activities, however, will result in incremental impacts to wetland habitat. As noted earlier, both adverse and beneficial impacts will occur. Adverse impacts will principally be comprised of removal of wetland habitat at scattered locations along wash systems such as Flamingo and Tropicana. Many of these wetlands are human-caused due to persistent urban/residential irrigation runoff. The value of these wetlands as habitat for wildlife is relatively limited because they: (1) are limited in size and occur in fragmented, isolated patches; (2) often include weedy, introduced plant species, such as tamarisk (Tamarix spa.) and smotherweed (Bassia hyssopifolia); and (3) are subject to degradation due to human-caused disturbance.

Potential impacts to the lower Las Vegas Wash are described above. However, CCRFCD is developing facilities in coordination with management personnel of the Las Vegas Wash Wetland Park to accomplish an erosion control plan that will preclude adverse impacts due to erosion from increased peak runoff. Beneficial impacts to wetlands in the lower Las Vegas Wash due to operation of CCRFCD facilities are likely, resulting from a stabilized hydrologic regime. The reestablishment of emergent and aquatic wetland vegetation allowed by detention and subsequent lowered peak flows of runoff water would be considered a beneficial impact.

The beneficial aspects of reduced scour and erosion in wetland areas in the lower Las Vegas Wash could include: (1) larger sizes of individual wetlands; (2) reduced separation of established wetlands; (3) increased diversity of plant species, including a higher proportion of native wetlands species; and, (4) increased stature of individual riparian plants associated with reduced frequency of disturbance by scour. Based on these factors, wetlands recreated by CCRFCD facilities would be of higher quality wildlife habitat compared to that provided by the small wetlands in Flamingo, Tropicana, and other washes that are expected to be removed during construction of CCRFCD facilities. As a result, the net cumulative impacts on wetlands due to construction and operation of these facilities are likely to be beneficial or not-significantly adverse.

13.4.7 Land Use

As indicated in Section 15.7.2, the majority of the 10-year plan structures are located on vacant land, or coincident with existing flood control corridors or facilities and installation would not result in any direct land use impacts. Potentially significant impacts are associated with construction and operation of facilities C2, C3, C4, C9, S10, S24, S25, 4110. The land use conflict with the N3 and N5 facilities within the Quail Spring Wilderness Study Area can be eliminated by the use of the N3-8 Alternative facility.

Types of construction impacts to land uses would include public nuisances and inconveniences such as fugitive dust during grading and earthmoving activities, increased noise levels from equipment, public safety hazards at the construction sites, temporary construction detours, and potential interruptions in normal utility services. Nearly all of these impacts can be effectively mitigated and none are considered to reach significant levels.

Operational impacts would include effects on residential, commercial, educational, and emergency response facilities through (1) the elimination, displacement, or relocation of existing structures, (2) the creation of barriers causing inaccessibility or affecting expansion of future development, or (3) the division of existing land use patterns. However, in some instances, the installation of these "barriers" may result in a beneficial impact by separating non-compatible land uses. And in all cases, these facilities would help protect development from flood waters. The identified adverse impacts can be mitigated to less significant levels through the implementation of the recommended measures described in Table 9-5.

As stated in Section 13.3.6, the concern that installation of the proposed flood control facilities may contribute to cumulative land use effects and induce growth by providing protection against flood waters assumes that the absence of said structures is presently a restriction in growth. Historical growth data prove this assumption to be incorrect. In fact, recent growth indicates that official population projections for the Las Vegas Valley may be grossly underestimated, independent of the proposed project. The overall land use in the valley is changing from open space to urban as a result of growth pressures unrelated to flood control facilities. Furthermore, as presented in Table 2-3, the Flood Control District's priorities emphasize the protection of existing development rather than promote future development. Therefore, the regional flood control program would not directly contribute to the cumulative growth in the Las Vegas Valley, but may facilitate development in the immediate vicinity of the Las Vegas Wash in the extreme northwest portion of the Las Vegas Valley, and in the outer fringes of the southwest Las Vegas Valley, primarily near the Duck Creek system. No proposed large-scale plans for development within the next 10 years are presently reported in these areas. The proposed project would not, however, limit future land use possibilities.

13.4.8 Visual Resources

Construction related impacts to visual resources would include disturbance of existing landscape settings by changing the color and texture of the soils and potentially creating localized dust clouds from initial earthwork. Construction impacts would be short-term and able to be mitigated to non-significant levels through soil replacement, final grading, and application of water to the ground surface during construction.

The long-term, cumulative impacts to visual resources include the introduction of large-scale or linear changes in the line, form, color and texture of the area at various locations around the valley and expanding the area of impacts over a much larger area. The presence of the proposed flood control structures ranges from dominating views in some areas to minimally changing the existing visual character in others (refer to Table 10-4, "Potential Long-Term Visual Resources Impacts"). The application of mitigation measures identified in Table 15-13 for each facility is expected to effectively minimize the potential impacts for the majority of the proposed facilities. Most of the structures are proposed in areas relatively close to an area where the rural character of the area has been significantly modified. Therefore, the degree of apparent change would be minimal in that the changes would reflect elements found in the urbanized areas nearby. However, the 10-year plan facilities include detention basins and dikes located in the extreme northwestern and southwestern portions of the valley (see Figure 3-1 for locations of 10-year plan facilities). Because these regions are presently rural in nature and are expected to remain so in the near future (no plans for major development in the next 10 years are presently proposed), the proposed project would have a cumulative effect of extending the urban character of development to these outer fringes. Current plans for future development projects, identified in Table 13-1 and on Figure 13-1, are primarily concentrated in the north, south, east and west. The flood control facilities would add to this overall urbanized visual effect by introducing man-made structures to what are now rural areas.

13.4.9 Socioeconomics

Construction impacts on socioeconomics would be both adverse and, to some extent, beneficial. As indicated in Section 11.3.1, some of the 10-year plan facilities would require removal or displacement of existing structures. However, the District's policy is to avoid such displacement and therefore the adverse impacts are expected to be negligible. The project would benefit the local economy in terms of providing temporary employment opportunities, contributing to the local income base, and slightly increasing the values of those properties adjacent to the flood control facilities.

Operational impacts would be beneficial through the protection of people and property. Resources formerly devoted to repairing flood damaged assets would be shifted to maintaining the flood control facilities.

Because the socioeconomic impacts are negligible or positive, the proposed project is not expected to contribute to any adverse cumulative effects associated with concurrent or future project plans in the Las Vegas Valley.

13.4.10 Cultural Resources

As indicated in Section 15.10 of the EIS, proposed 10-year plan facilities have the potential to directly or indirectly affect several archaeological sites and historic resources. Although these effects are considered potentially significant, any effect to cultural resources will be considered through the Section 106 process. The implementation of major land development projects identified in Table 13-1 may also affect archaeological and historic resources. Because specific plans for the treatment of cultural resources on those properties are not presently identified, the overall impacts of these land developments must be presumed significant in this analysis. Based on the data presented in Section 15.10, the Cultural Resource section, the following number of sites, by ranking, will be affected as a result of cumulative impacts to blocks of 10,000 acres in Las Vegas Valley.

Las Vegas Valley North. Of the highest ranked sites, two rockshelters and 21 roasting pits will be affected per 10,000 acres of disturbance. Of the medium ranked sites, 38 open camps and 1 historic site will be affected. It is estimated that only four highest ranked and four medium ranked sites will be affected through present and future disturbance.

Las Vegas Valley Central. Of the highest ranked resources, three rockshelters, eight roasting pits, and two rock art sites will be impacted per 10,000 acres. Of the medium ranked sites, 22 open camps and six historic properties will be affected. It is estimated that 24 highest ranked and 48 medium ranked sites will be affected through present and future disturbance.

Las Vegas Valley Southwest. Of the highest ranked sites, one rockshelter, one roasting pit and one rock art site will be affected per 10,000 acres. Of the medium ranked sites, six open camps and one historic site will be affected. Of the lower ranked sites, one rock feature will be affected. It is estimated that 29 highest ranked, 59 medium ranked and four lowest ranked sites will be affected through present and future disturbance.

Henderson. Of the highest ranked sites, one rockshelter and one roasting pit will be affected per 10,000 acres. Of the medium ranked sites, one open camp site will be affected. It is estimated that two highest ranked, eight medium ranked and one lowest ranked sites will be affected through present and future disturbance.

Boulder City. Of the highest ranked sites, one roasting pit will be affected per 10,000 acres. Of the medium ranked sites, 13 historic sites will be affected. It is estimated that only one medium ranked site will be affected through present and future disturbance.

Summary of the Five Zones. As a result of surface disturbance from the presently proposed and potential future impacts, an estimated 40 highest ranked sites, 78 medium ranked and five lowest ranked sites will be affected per 10,000 acres. It is estimated that 59 highest ranked, 120 medium ranked and five lowest ranked sites will be affected through presently proposed and future disturbance.

Evaluation of Cumulative Effects. Based on the sample of surveyed land within Las Vegas Valley and the relatively low number of highly ranked recorded sites, there will be no significant impacts to cultural resources as a result of presently proposed and future surface disturbance in Las Vegas Valley.

If second-phase mitigation is applied, project activities are not expected to result in significant adverse impact. If construction management mitigation is impractical, detailed facility-specific emissions calculations should be prepared and potential impacts on TSP levels determined by application of air quality models. If these models identify the potential for significant adverse air quality impacts, a project-specific EIS should be prepared to identify appropriate facility modifications and/or additional mitigation required to reduce impacts to acceptable levels.

14.2.2.2 Carbon Monoxide

The analytical procedure applied to project-specific CO emissions is analogous to that described for short-term TSP emission thresholds in Section 14.2.2.1 above. The CO evaluation procedure is illustrated in Figure 14-3. In this case, emission thresholds were established for areas within one mile of known CO standard violations (referred to as the CO exceedence zone and depicted in Figure 4-1). CO threshold emissions within the exceedence zone were established on the basis of facility emission levels, which were expected to result in insignificant (not measurable) CO impacts. CO threshold emissions outside of the exceedence zone were determined on the basis of facility emission levels which were expected to result in ambient CO impacts of approximately one half of the 1-hour and 8-hour standards. Mitigation evaluation for CO emissions is to be implemented in the same two-phase approach presented for PM emissions.

14.3 GEOLOGY AND SOILS

The analysis of potential effects associated with geologic conditions includes an evaluation of geologic hazards and constraints that require special engineering design or construction practices, as well as an analysis of potential impacts of flood control facilities on geologic and soils resources. The procedure to be applied to each individual project involves the mapping of proposed facilities on the soils and geologic hazards maps (Figures 5-4 and 5-7) and identification of potential resource sensitivity and hazards by review of Tables 5-1, 5-2, and 5-3. This information is compared to information concerning facility-type hazards and impacts of concern prepare a composite listing of potential facility-specific hazards and constraints. Field investigations focused on identified concerns are then conducted to refine mapped resource information and allow the compilation of tabular listings of resources affected and impacts anticipated at each facility. This information is used as the basis for determination of special design requirements, appropriate mitigation, need for additional environmental studies if any, and final conclusions regarding the acceptability of geologic and soils impacts. Figure 14-4 illustrates the application of this project-specific review process.

14.4 GROUND WATER

The analysis of potential ground-water related impacts presented in Section 6.0 identified two concerns considered potentially significant. These concerns include: 1) construction difficulties associated with the presence of shallow ground water, and 2) facility impacts associated with the reduction of discharge from the shallow aquifer. The second concern is the only one which is considered an environmental impact and it is considered potentially significant with respect to any proposed lining of existing unlined channels in areas of shallow ground water.

The procedure to be applied to evaluate potential ground-water impacts and determine appropriate mitigation is summarized on Figure 14-5. In general, this process involves the application of identified mitigation to allow discharge to shallow ground water from lined channels, and to include special construction practices addressing the presence of shallow ground water. If identified mitigation

Application of the mitigation measures identified in Table 15-13 is expected to effectively reduce the potential impacts of the proposed facilities. Although residual impacts of some facilities may be considered locally significant to some viewers, the overall public benefit of the flood protection afforded by these facilities is expected to outweigh potential residual impacts if the suggested mitigation measures are applied.

15.9 Socioeconomics

The 10-year plan facilities listed in Section 3.0 were subjected to the project prioritization process described in the District's Policy and Procedures Manual (Bax-Valentine, 1988). The process seeks to avoid locating facilities on developed property such as residential, commercial or institutional in order to minimize costs of land acquisition and relocation of established activities. It is not necessary, therefore, to test the current list of proposed facilities for intrusion into developed properties or intersection/displacement of vital public services. The principal impact on the proposed list of facilities will be to necessitate improvements to highway crossings over flood channels, the costs of which have already been taken into account in the prioritization process.

As noted earlier in Section 11.4, should modifications or additions be proposed to the current 10-year plan list of projects, these would have to be evaluated for possible displacement or disruption of existing property developments. The procedure would consist of locating the site of the proposed flood control facility on suitable maps or photographs, augmented possibly by an on-site inspection, to assess the potential for developed property disruption. Were such to be the case, an appraiser would have to be retained to estimate costs of damages and relocation.

15.10 CULTURAL RESOURCES

15.10.1 Archaeological Resources

The facilities of the 10-year program for the Detention/Conveyance alternative were analyzed for the presence of, and potential impacts to, cultural resources by construction and/or operation of individual facilities. Impacts would occur to individual cultural resources, archaeological sites and isolated artifacts, as well as to archaeological sensitivity areas. Tabulations of impacts to previously recorded archaeological resources are presented in Table 15-14 while impacts to archaeological sensitivity areas are listed in Table 15-15. The relationship of project facilities to individual archaeological resources are categorized into three levels. These are: 1) "on," where the site and facilities locations are coterminous, 2) "adjacent," where the site is within 0.2 mile of the facility, and 3) "within 0.5 mile," where the site is located between 0.2 and 0.5 mile of the facility.

Facility types included floodways, detention and debris basins, dikes, levees, lined and unlined channels, pipeline/box conduits, culverts, and bridges. Of the 10-year plan projects, 11 will be located on, adjacent to, or within 0.5 mile of specific archaeological cultural resources (Table 15-14). Five archaeological sensitivity areas will be directly affected by 24 of the 10-year program facilities (Table 15-15). A total of 13 sites are "on," seven are "adjacent" to and 17 are located within 0.5 mile of an individual facility.

For each of the five subareas of interest (Las Vegas Valley North, Las Vegas Valley Central, Las Vegas Valley Southwest, Henderson and Boulder City) known site locations were tallied according to site types defined by Myhrer (1991). According to Myhrer's topology, sites in the Las Vegas Valley area can be categorized into seven major types. The types are: roasting pits/complexes, rockshelters, rock art, camp sites, prehistoric structures, historic structures or trash scatters, and rock features such as a rock ring or alignment. Many sites possess more than one feature, for example, roasting pits are often found in association with rockshelters. A few sites have features of all categories. Information from the recording forms was used to place each site into only one category based on ranking that primarily selected for the best management potential.

Because rockshelter sites are considered to have the most potential for management uses, its presence at a site dominates the ranking of all other types. Roasting pit sites are ranked second due to the large number of these features in the resource area. Due to its high potential for public uses, rock art is third ranked. Rock art that is associated with a rockshelter site is also highly ranked. A pit structure with or without artifacts is fourth ranked. An open site with artifacts or hearths is called a camp and is ranked fifth. Historic remnants are placed into the sixth type. Finally, a rock feature is ranked seventh (Myhrer 1991:6). Based on the descriptions above, the following site types are ranked into high, medium and low categories: (1) high - rock shelters, roasting pits, rock art, prehistoric structures; (2) medium - open camps and historic structures; and (3) low - rock features.

The total acreage of areas previously subjected to archaeological inventory was also calculated. From these numbers, an estimate was made of the numbers of each type of site that might be expected to be found per acre in each of the project subareas (Tables 15a through 15e). In addition, the total acreage of previously developed land, the acreage of property to be utilized during the present project, and the total acreage of land expected to be developed in the foreseeable future were calculated for each of the five subareas. These figures were then used in conjunction with the above figures to estimate the numbers of each site type in each subarea that may have been or will be impacted in the future.

Las Vegas Valley - North

This subarea is comprised of approximately 181,860 acres. Archaeological inventory was conducted on approximately 14.79% of this area. Based on the previous recordation of archaeological sites in the area, it appears that about 4 prehistoric camps or open sites are likely to be directly affected during the present project, while 120 of these sites may have been impacted during previous development in the subarea. Future development is estimated to affect four of these site types. Roasting pits, which rank highly in terms of potential for management uses, are the next most common site type in the northern Las Vegas Valley subarea; the present project can be expected to affect two of these sites.

Las Vegas Valley - Central

The central Las Vegas Valley subarea is estimated to comprise 84,920 acres. Approximately 10.24% of this land has been subjected to archaeological inventory. Camps/open sites are the most prevalent site type in this subarea, but the present flood control project can be expected to affect only one. Future development, however, because it is so extensive in this area, may affect as many as 38 of this type of site. Future development may also impact about 14 roasting pits, but it is estimated that the present project will have little or no affect on these types resources.

Las Vegas Valley - Southwest

This is the largest of all of the five subareas comprising approximately 214,720 acres. Only 9.03% of this area has been inventoried for archaeological resources. As with the previous subareas, camps/open sites dominate followed by roasting pits. The present project can be expected to impact four open sites and one roasting pit, while future development may affect as many as 54 open sites and 13 pits.

Henderson

The Henderson subarea is estimated to comprise 50,440 acres. Of this, archaeological inventory has been conducted on 8.25%. Open sites are most prevalent, but the present project should affect only one. Future development, however, may be expected to impact over seven of these site types. Rockshelters, which rank the highest of all site types in terms of potential for management uses (Myhrer 1991), are the next most frequently observed site type in the Henderson subarea. These do not occur frequently, however,and are not expected to be severely affected during the present project; future development should affect only one.

Boulder City

The final subarea, which includes the community of Boulder City is the smallest of the five subareas and comprises approximately 4,520 acres. Only 240 acres, or 5.31%, of this area, has been subjected to archaeological inventory, and thus the accuracy of the estimations of site types to be found and affected in this subarea is questionable. However, based on the information that is available, historic structures, including the historic district of Boulder City, are most frequently found here and the present project can be expected to affect one of these sites. In addition, a single roasting pit was recorded in the Boulder City subarea, but it is highly unlikely that the present project will affect others. No future development is planned in this subarea.

As noted in Section 14.10 and in accordance with the mitigation measures detailed in Section 12.6.1, the District will conduct an updated record search on all facilities in the 10-year program. Based on this records search and the sensitivity analysis presented in 12.3.1, the District will consult with BLM and SHPO to determine survey requirements. A Class III survey of the areas of potential effect will be conducted. Following completion of the survey, CCFCD will consult with BLM and SHPO on the significance of inventoried resources. If any are found to be eligible for the National Register, a treatment plan will be developed in consultation with BLM, SHPO, and ACHP.

One known archaeological site, 26-Ck-948 (the Las Vegas Springs Site), is on the National Register of Historic Places. CCFCD will consult with BLM, SHPO, and ACHP regarding appropriate treatment of this site.

15.10.2 Ethnographic Resources

The 10-year program would not affect any specific resources in the ethnographic inventory. Nonetheless, Native American groups have expressed general concern for archaeological resources. In accordance with the mitigation measures described in Section 12.6.2 (above), appropriate members of the Las Vegas Paiute Indian Tribe and Moapa Paiute Indian Tribe will be consulted regarding treatment the Las Vegas Paiute Indian Tribe and Moapa Paiute Indian Tribe will be consulted regarding treatment of significant archaeological sites. During the archaeological survey, knowledgeable elders will be consulted about specific resources of concern. Any mitigation measures that may be necessary will be discussed with participating elders and other appropriate Southern Paiute leaders.

15.10.3 Historic Resources

Twenty historic resources could be subject to either direct or indirect impact from the 10-year program (Table 15-16). Direct impacts would occur to Historic Site #1 (Las Vegas Springs) and Historic Site #3 (Mormon Fort), both of which are on the National Register. Additionally, indirect effects could occur to Historic Site #13, a structure that has been determined eligible for the National Register. CCFCD will consult with BLM, SHPO, and ACHP regarding appropriate treatment of these three sites.

In accordance with the mitigation measures presented in section 12.6.3, CCFCD will conduct an updated historical inventory when all facilities have been sited. This will include review of existing registers of historic sites and primary historic documents that record potential site locations. Field reconnaissance will be conducted at all recorded sites and locations of potential historic resources as revealed by the review of primary documents. Informal consultation with SHPO has been initiated to identify the potential significance of inventoried resources. If any are found to qualify for the National Register, BLM, SHPO, and ACHP will be consulted to determine appropriate treatment necessary to adequately avoid or mitigate potential impacts.

Table 15a

LAS VEGAS VALLEY NORTH

14.79% surveyed for cultural resources.

Site Type	Rank	Density/ Acre	Total Expected Sites	Disturbed Sites Expected: Past	Present	Future
Rockshelter	1	0.00022	40	7	<1	<1
Roasting Pit	2	0.00208	377	65	2	2
Rock Art	3	0	0	0	0	0
Rock Art/ Rockshelter	(3)	0	0	0	0	0
Prehistoric Structure	4	0	0	0	0	0
Camp/ Open Site	5	0.00383	695	120	4	4
Historic Site	6	0.00045	82	14	<1	<1
Rock Feature	7	0.00015	27	4	<1	<1

Surveyed:	26,860	(14.79%)
Total Acreage:	181,560	
Previously Developed:	31,360	
Future Developments:	1120	
Present Project:	934	

Table 15b

LAS VEGAS VALLEY CENTRAL

10.24% surveyed for cultural resources.

Site Type	Rank	Density/ Acre	Total Expected Sites	Disturbed Sites Expected: Past	Present	Future
Rockshelter	1	0.00035	30	11	<1	6
Roasting Pit	2	0.00080	70	27	<1	14
Rock Art	3	0.00023	20	8	<1	4
Rock Art/ Rockshelter	(3)	0	0	0	0	0
Prehistoric Structure	4	0	0	0	0	0
Camp/ Open Site	5	0.00218	185	72	1	38
Historic Site	6	0.00057	48	19	<1	10
Rock Feature	7	0	0	0	0	0

Surveyed:	8,700	(10.24%)
Total Acreage:	84,920	
Previously Developed:	33,140	
Future Developments:	17,600	
Present Project:	465	

Table 15c

LAS VEGAS VALLEY SOUTHWEST

9.03% surveyed for cultural resources.

Site Type	Rank	Density/ Acre	Total Expected Sites	Disturbed Sites Expected: Past	Present	Future
Rockshelter	1	0.00103	221	48	<1	10
Roasting Pit	2	0.00144	309	67	1	13
Rock Art	3	0.00067	144	31	<1	6
Rock Art/ Rockshelter	(3)	0.00010	21	5	<1	<1
Prehistoric Structure	4	0	0	0	0	0
Camp/ Open Site	5	0.00583	1252	271	4	54
Historic Site	6	0.00052	112	24	<1	5
Rock Feature	7	0.00041	88	19	<1	4

Surveyed: 19,390 (9.03%)
Total Acreage: 214,720
Previously Developed: 46,560
Future Developments: 9,280
Present Project: 704

Table 15d

HENDERSON

8.25% surveyed for cultural resources.

Site Type	Rank	Density/ Acre	Total Expected Sites	Disturbed Sites Expected: Past	Present	Future
Rockshelter	1	0.00096	48	12	<1	1
Roasting Pit	2	0.00072	36	9	<1	1
Rock Art	3	0	0	0	0	0
Rock Art/ Rockshelter	(3)	0	0	0	0	0
Prehistoric Structure	4	0	0	0	0	0
Camp/ Open Site	5	0.00529	267	65	1	7
Historic Site	6	0.00072	36	9	<1	1
Rock Feature	7	0.00072	36	9	<1	1

Surveyed: 4,160 (8.25%)
Total Acreage: 50,440
Previously Developed: 12,220
Future Developments: 1,400
Present Project: 213

Table 15e

BOULDER CITY

5.31% surveyed for cultural resources.

Site Type	Rank	Density/ Acre	Total Expected Sites	Disturbed Sites Expected: Past	Present	Future
Rockshelter	1	0	0	0	0	0
Roasting Pit	2	0.00416	19	14	<1	0
Rock Art	3	0	0	0	0	0
Rock Art/ Rockshelter	(3)	0	0	0	0	0
Prehistoric Structure	4	0	0	0	0	0
Camp/ Open Site	5	0	0	0	0	0
Historic Site	6	0.01250	56	43	1	0
Rock Feature	7	0	0	0	0	0

Surveyed:	240	(5.31%)
Total Acreage:	4,520	
Previously Developed:	3,430	
Future Developments:	0	
Present Project:	90	

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Williams, Bill, Clark County Fire Department, Las Vegas, NV, 11/16/88

Zohner, Jerry, Chief, North Las Vegas Police Department, City of North Las Vegas, NV, 12/15/88

18.10 CULTURAL RESOURCES[1]

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Becksted, Matthew, Planner 2, Clark County Comprehensive Planning, Las Vegas, NV, 11/7/88

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Janice, City Planning Department, City of Las Vegas, Las Vegas, NV, 1988

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Lichty, Alan S., Programmer/Analyst, Archaeological Center, Department of Anthropology, University of Utah, Salt Lake City, UT, 10/28/88

Manry, Pat, Planner, Office of Development and Planning, Las Vegas, NV, 11/21/88

Myhrer, Keith, Archaeologist, Bureau of Land Management, Stateline Resource Area, Las Vegas, NV, 10/28/88 and 11/4/88

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Wolf, Art, Nevada State Museum and Historical Society, Lorenzi Park, Las Vegas, NV, 11/7/88 and 11/21/88

Wright, Frank, Curator of Education, Nevada State Museum and Historical Society, Las Vegas, NV, 11/9/88, 11/21/88 and 11/23/88

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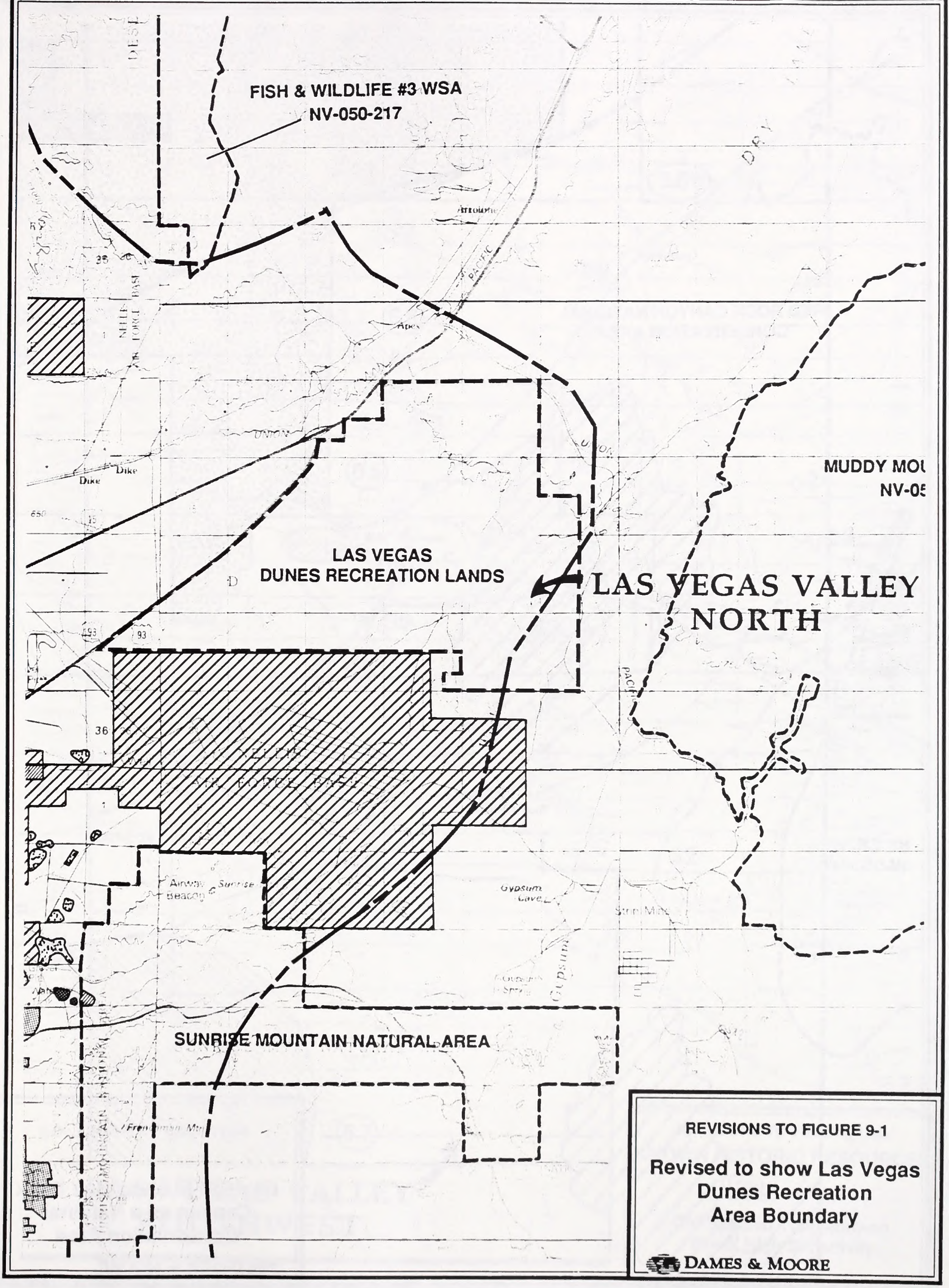
[1] Also see Table 12-13, Contact Program Summary

2.3 FIGURE REVISIONS

FIGURE REVISIONS

Fig.No.	Title	Revision
9-1	General Land Use Classification	Las Vegas Dunes Recreation Area added
10-2	Visual Character Map	Redrock Canyon added
12-2	Known Historic Resources	Old Spanish Trail / Mormon Road added
13-1	Current and Proposed Master Planned Residential Communities	Proposed developments revised
14-1	Overall Project-Specific Analysis Procedure	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-2	Project Specific Analysis Procedure, Air Quality Impacts - TSP	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-3	Project Specific Analysis Procedure, Air Quality Impacts - CO	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-4	Project Specific Analysis Procedure, Geology and Soils	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-5	Project Specific Analysis Procedure, Ground Water	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-6	Project Specific Analysis Procedure, Surface Water Resources	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-7	Project Specific Analysis Procedure, Biological Resources	"Second-Tier EIS" changed to "second-tier environmental analysis"

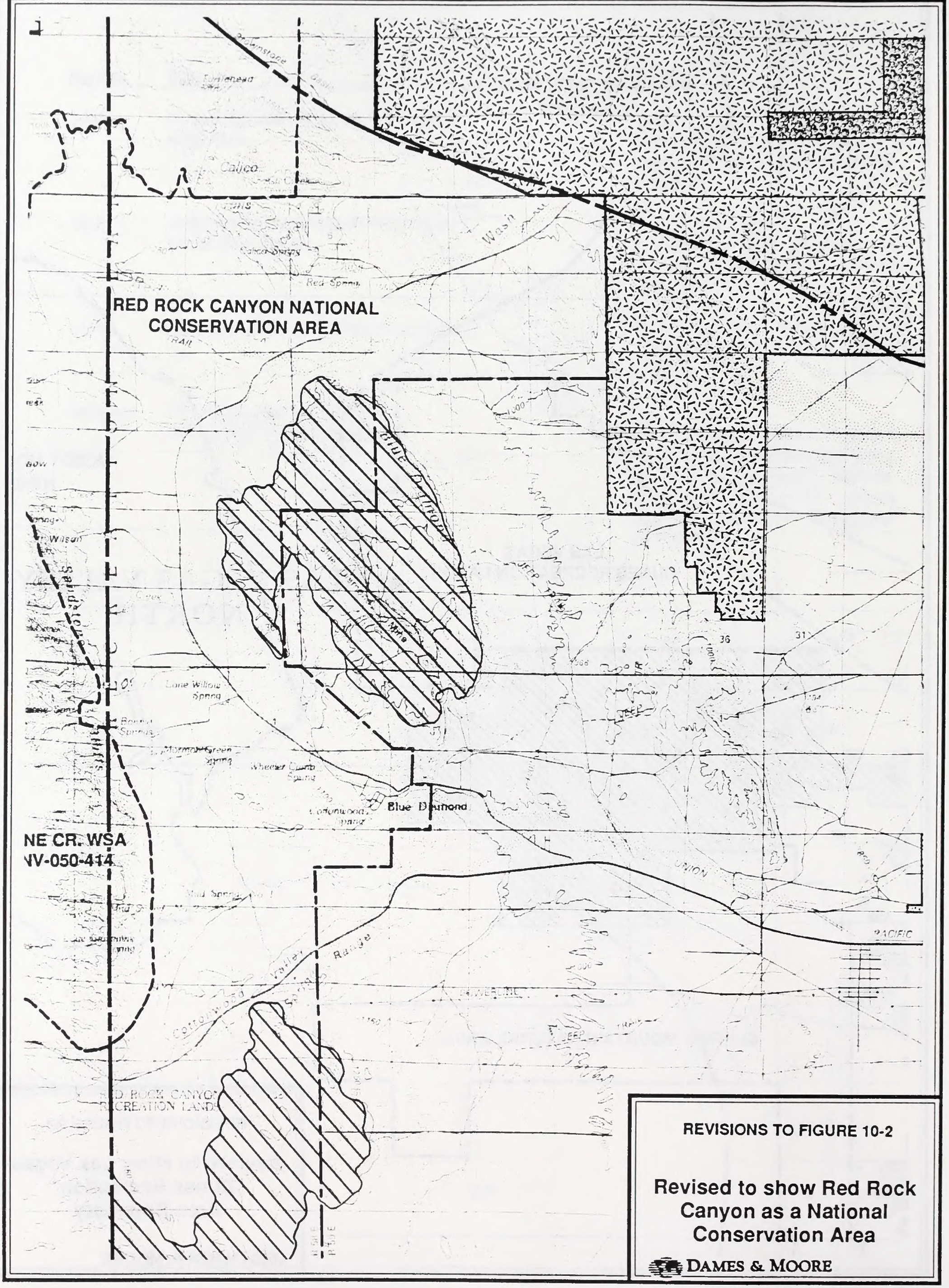
Fig.No.	Title	Revision
14-8	Project Specific Analysis Procedure, Land Use	"Second-Tier EIS" changed to "second-tier environmental analysis"
14-9	Project Specific Analysis Procedure, Visual Resources	"Second-Tier EIS" changed to "second-tier environmental analysis"
15-37	Sensitive Biological Resources (A2-8)	Wetlands added along Tropicana and Flamingo Washes and Duck Creek
A2-14(b)	Flood Control Alternative B, Hemenway Valley Watershed	New figure showing flood control devices ending at park boundary with energy-dissipating devices. This new figure also shows location of the Lake Mead NRA boundary.



REVISIONS TO FIGURE 9-1

Revised to show Las Vegas Dunes Recreation Area Boundary

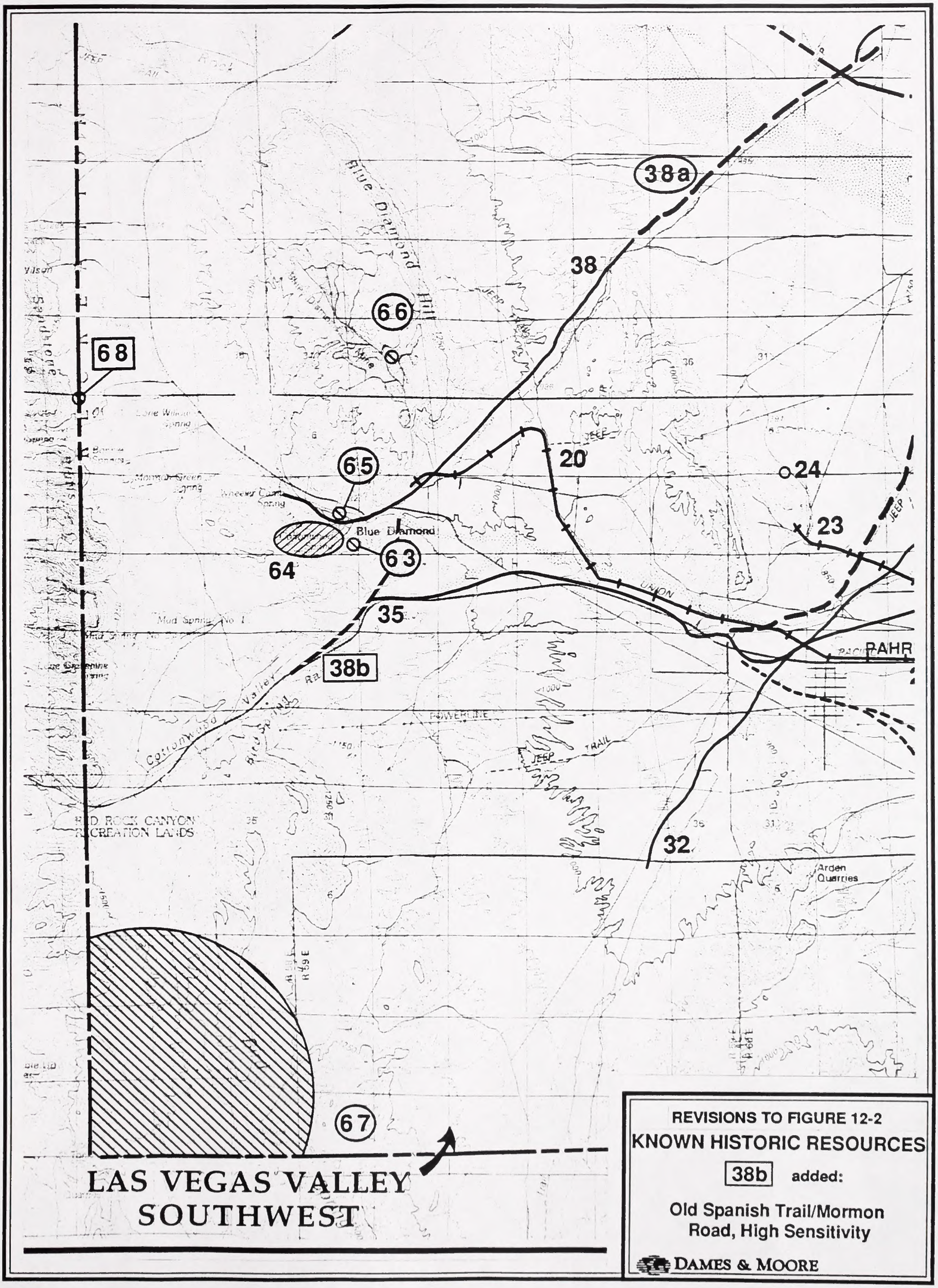
DAMES & MOORE



REVISIONS TO FIGURE 10-2

Revised to show Red Rock Canyon as a National Conservation Area

DAMES & MOORE



LAS VEGAS VALLEY SOUTHWEST

REVISIONS TO FIGURE 12-2

KNOWN HISTORIC RESOURCES

38b added:

Old Spanish Trail/Mormon Road, High Sensitivity

DAMES & MOORE

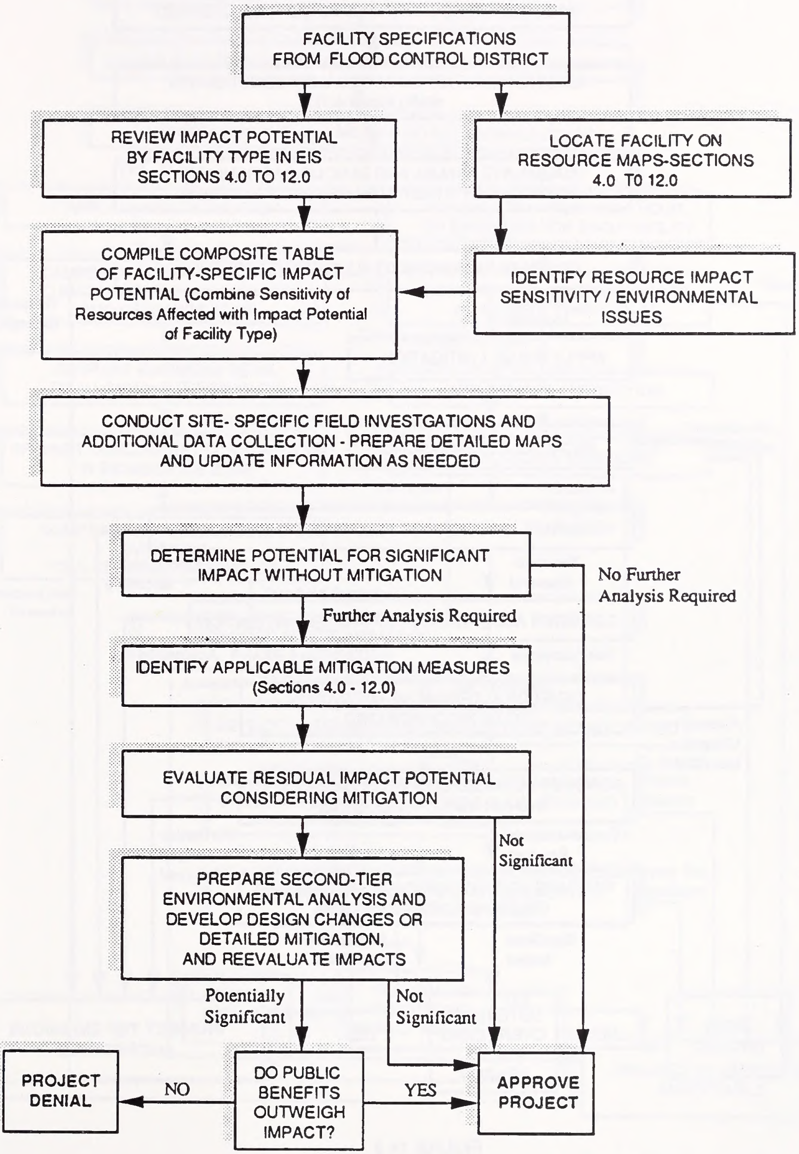

FACILITY SPECIFICATIONS FROM FLOOD CONTROL DISTRICT
REVIEW IMPACT POTENTIAL BY FACILITY TYPE IN EIS SECTIONS 4.0 TO 12.0
LOCATE FACILITY ON RESOURCE MAPS-SECTIONS 4.0 T0 12.0
COMPILE COMPOSITE TABLE OF FACILITY-SPECIFIC IMPACT POTENTIAL (Combine Sensitivity of Resources Affected with Impact Potential of Facility Type)
IDENTIFY RESOURCE IMPACT SENSITIVITY / ENVIRONMENTAL ISSUES
CONDUCT SITE- SPECIFIC FIELD INVESTGATIONS AND ADDITIONAL DATA COLLECTION - PREPARE DETAILED MAPS AND UPDATE INFORMATION AS NEEDED
DETERMINE POTENTIAL FOR SIGNIFICANT IMPACT WITHOUT MITIGATION
No Further Analysis Required
Further Analysis Required
IDENTIFY APPLICABLE MITIGATION MEASURES (Sections 4.0 - 12.0)
EVALUATE RESIDUAL IMPACT POTENTIAL CONSIDERING MITIGATION
Not Significant
PREPARE SECOND-TIER ENVIRONMENTAL ANALYSIS AND DEVELOP DESIGN CHANGES OR DETAILED MITIGATION, AND REEVALUATE IMPACTS
Potentially Significant
Not Significant
PROJECT DENIAL
NO
DO PUBLIC BENEFITS OUTWEIGH IMPACT?
YES
APPROVE PROJECT

FIGURE 14-1

OVERALL PROJECT-SPECIFIC ANALYSIS PROCEDURE

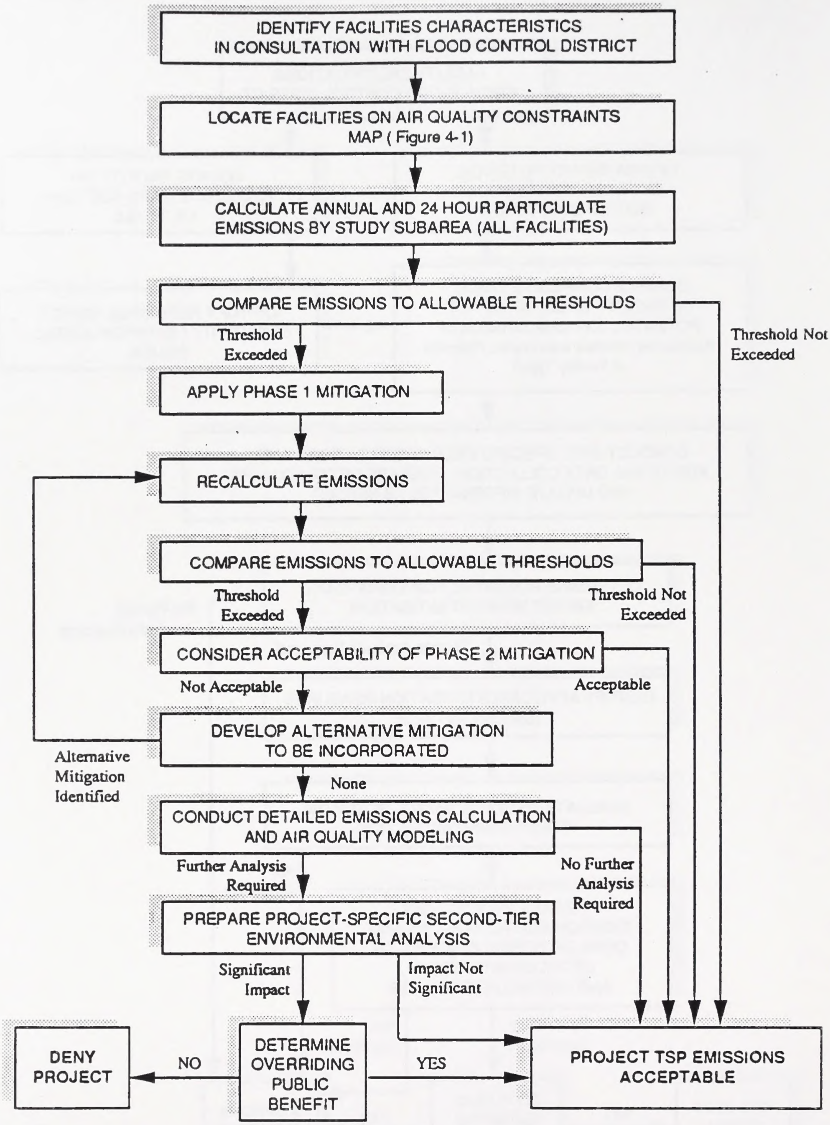

IDENTIFY FACILITIES CHARACTERISTICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
LOCATE FACILITIES ON AIR QUALITY CONSTRAINTS MAP (Figure 4-1)
CALCULATE ANNUAL AND 24 HOUR PARTICULATE EMISSIONS BY STUDY SUBAREA (ALL FACILITIES)
COMPARE EMISSIONS TO ALLOWABLE THRESHOLDS
Threshold Exceeded
Threshold Not Exceeded
APPLY PHASE 1 MITIGATION
RECALCULATE EMISSIONS
COMPARE EMISSIONS TO ALLOWABLE THRESHOLDS
Threshold Exceeded
Threshold Not Exceeded
CONSIDER ACCEPTABILITY OF PHASE 2 MITIGATION
Not Acceptable
Acceptable
DEVELOP ALTERNATIVE MITIGATION TO BE INCORPORATED
Alternative Mitigation Identified
None
CONDUCT DETAILED EMISSIONS CALCULATION AND AIR QUALITY MODELING
Further Analysis Required
No Further Analysis Required
PREPARE PROJECT-SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
Significant Impact
Impact Not Significant
DENY PROJECT
NO
DETERMINE OVERRIDING PUBLIC BENEFIT
YES
PROJECT TSP EMISSIONS ACCEPTABLE

FIGURE 14-2

PROJECT-SPECIFIC ANALYSIS PROCEDURE
AIR QUALITY IMPACTS
TOTAL SUSPENDED PARTICULATES

DAMES & MOORE

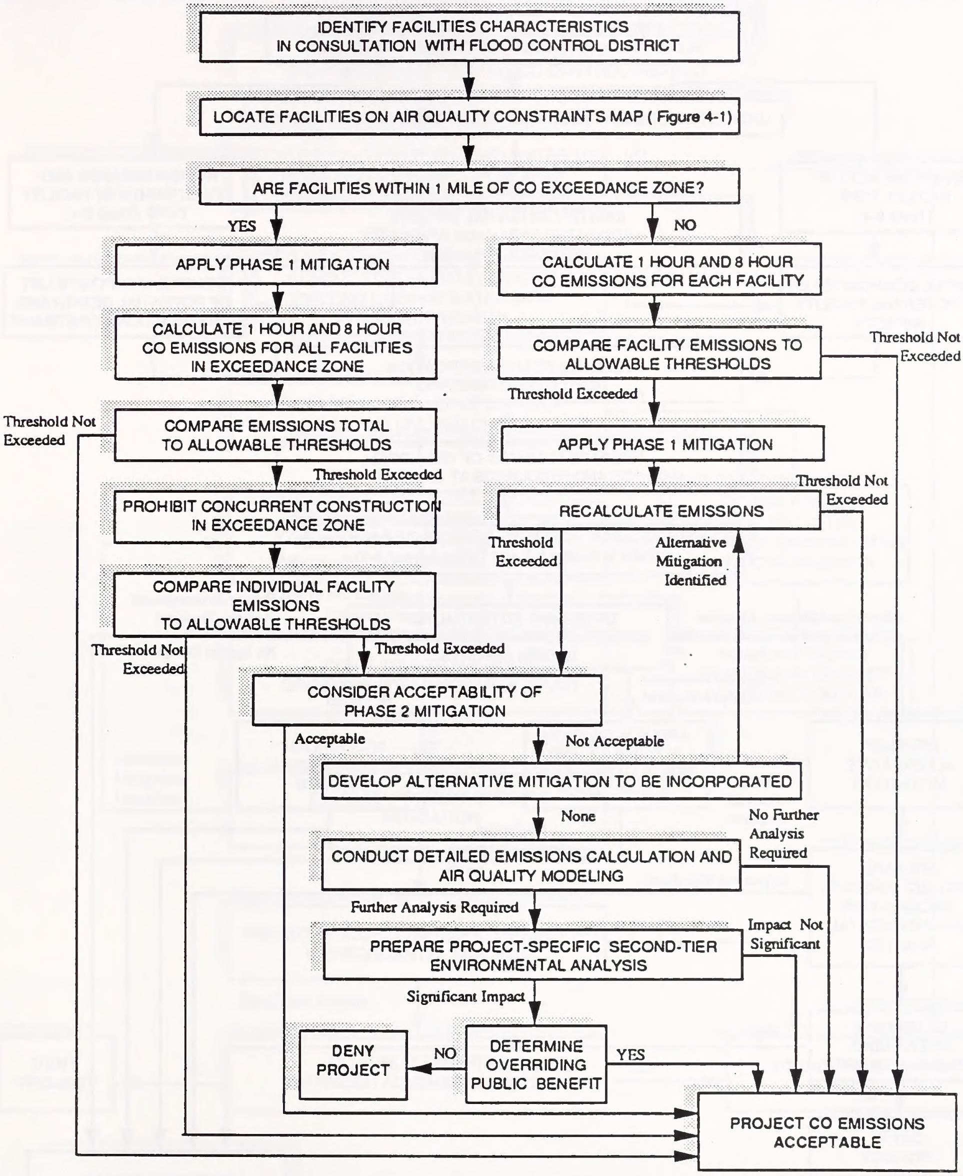

IDENTIFY FACILITIES CHARACTERISTICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
LOCATE FACILITIES ON AIR QUALITY CONSTRAINTS MAP (Figure 4-1)
ARE FACILITIES WITHIN 1 MILE OF CO EXCEEDANCE ZONE?
YES
NO
APPLY PHASE 1 MITIGATION
CALCULATE 1 HOUR AND 8 HOUR CO EMISSIONS FOR EACH FACILITY
CALCULATE 1 HOUR AND 8 HOUR CO EMISSIONS FOR ALL FACILITIES IN EXCEEDANCE ZONE
COMPARE FACILITY EMISSIONS TO ALLOWABLE THRESHOLDS
Threshold Not Exceeded
Threshold Exceeded
Threshold Not Exceeded
COMPARE EMISSIONS TOTAL TO ALLOWABLE THRESHOLDS
APPLY PHASE 1 MITIGATION
Threshold Exceeded
Threshold Not Exceeded
PROHIBIT CONCURRENT CONSTRUCTION IN EXCEEDANCE ZONE
RECALCULATE EMISSIONS
Threshold Exceeded
Alternative Mitigation Identified
COMPARE INDIVIDUAL FACILITY EMISSIONS TO ALLOWABLE THRESHOLDS
Threshold Not Exceeded
Threshold Exceeded
CONSIDER ACCEPTABILITY OF PHASE 2 MITIGATION
Acceptable
Not Acceptable
DEVELOP ALTERNATIVE MITIGATION TO BE INCORPORATED
None
No Further Analysis Required
CONDUCT DETAILED EMISSIONS CALCULATION AND AIR QUALITY MODELING
Further Analysis Required
Impact Not Significant
PREPARE PROJECT-SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
Significant Impact
DENY PROJECT
NO
DETERMINE OVERRIDING PUBLIC BENEFIT
YES
PROJECT CO EMISSIONS ACCEPTABLE

FIGURE 14-3

PROJECT-SPECIFIC ANALYSIS PROCEDURE
AIR QUALITY IMPACTS
CARBON MONOXIDE

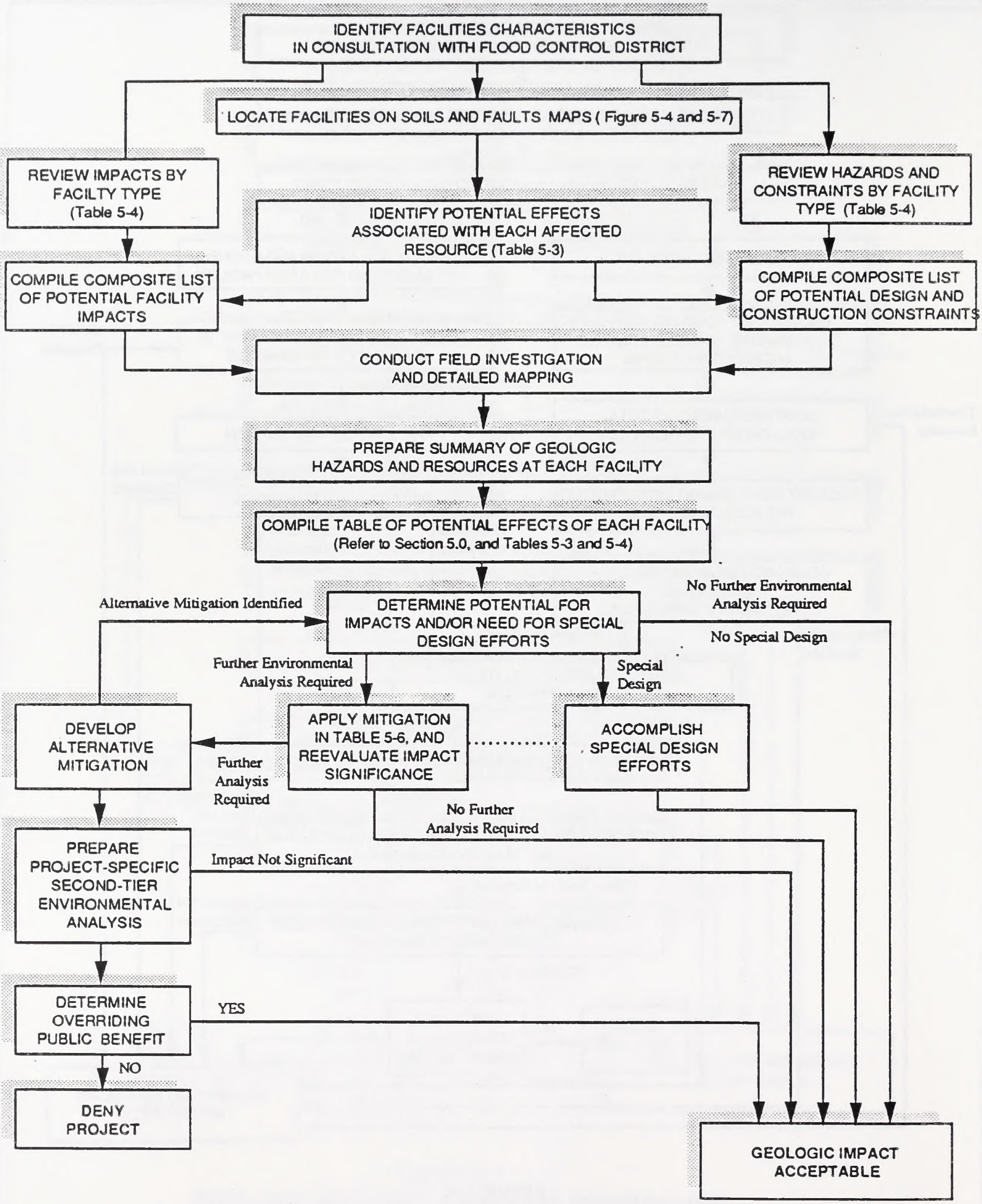

IDENTIFY FACILITIES CHARACTERISTICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
LOCATE FACILITIES ON SOILS AND FAULTS MAPS (Figure 5-4 and 5-7)
REVIEW IMPACTS BY FACILTY TYPE (Table 5-4)
IDENTIFY POTENTIAL EFFECTS ASSOCIATED WITH EACH AFFECTED RESOURCE (Table 5-3)
REVIEW HAZARDS AND CONSTRAINTS BY FACILITY TYPE (Table 5-4)
COMPILE COMPOSITE LIST OF POTENTIAL FACILITY IMPACTS
COMPILE COMPOSITE LIST OF POTENTIAL DESIGN AND CONSTRUCTION CONSTRAINTS
CONDUCT FIELD INVESTIGATION AND DETAILED MAPPING
PREPARE SUMMARY OF GEOLOGIC HAZARDS AND RESOURCES AT EACH FACILITY
COMPILE TABLE OF POTENTIAL EFFECTS OF EACH FACILITY (Refer to Section 5.0, and Tables 5-3 and 5-4)
Alternative Mitigation Identified
DETERMINE POTENTIAL FOR IMPACTS AND/OR NEED FOR SPECIAL DESIGN EFFORTS
No Further Environmental Analysis Required
No Special Design
Further Environmental Analysis Required
Special Design
DEVELOP ALTERNATIVE MITIGATION
Further Analysis Required
APPLY MITIGATION IN TABLE 5-6, AND REEVALUATE IMPACT SIGNIFICANCE
ACCOMPLISH SPECIAL DESIGN EFFORTS
No Further Analysis Required
PREPARE PROJECT-SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
Impact Not Significant
DETERMINE OVERRIDING PUBLIC BENEFIT
YES
NO
DENY PROJECT
GEOLOGIC IMPACT ACCEPTABLE

FIGURE 14-4

PROJECT-SPECIFIC ANALYSIS PROCEDURE
GEOLOGY AND SOILS

DAMES & MOORE

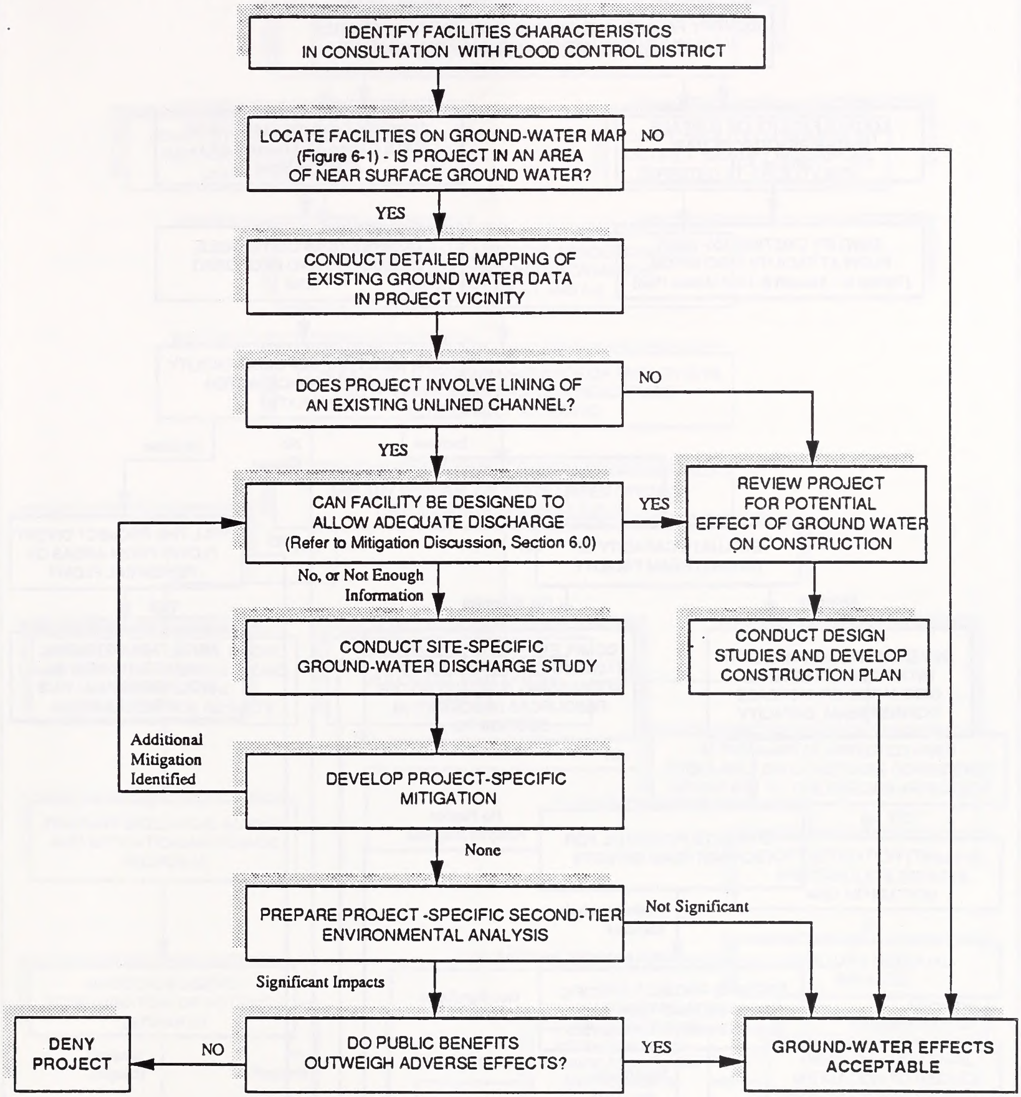

IDENTIFY FACILITIES CHARACTERISTICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
LOCATE FACILITIES ON GROUND-WATER MAP (Figure 6-1) - IS PROJECT IN AN AREA OF NEAR SURFACE GROUND WATER?
NO
YES
CONDUCT DETAILED MAPPING OF EXISTING GROUND WATER DATA IN PROJECT VICINITY
DOES PROJECT INVOLVE LINING OF AN EXISTING UNLINED CHANNEL?
NO
YES
CAN FACILITY BE DESIGNED TO ALLOW ADEQUATE DISCHARGE (Refer to Mitigation Discussion, Section 6.0)
YES
REVIEW PROJECT FOR POTENTIAL EFFECT OF GROUND WATER ON CONSTRUCTION
No, or Not Enough Information
CONDUCT SITE-SPECIFIC GROUND-WATER DISCHARGE STUDY
CONDUCT DESIGN STUDIES AND DEVELOP CONSTRUCTION PLAN
Additional Mitigation Identified
DEVELOP PROJECT-SPECIFIC MITIGATION
None
PREPARE PROJECT -SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
Not Significant
Significant Impacts
DENY PROJECT
NO
DO PUBLIC BENEFITS OUTWEIGH ADVERSE EFFECTS?
YES
GROUND-WATER EFFECTS ACCEPTABLE

FIGURE 14-5

PROJECT-SPECIFIC ANALYSIS PROCEDURE
GROUND WATER

DAMES & MOORE

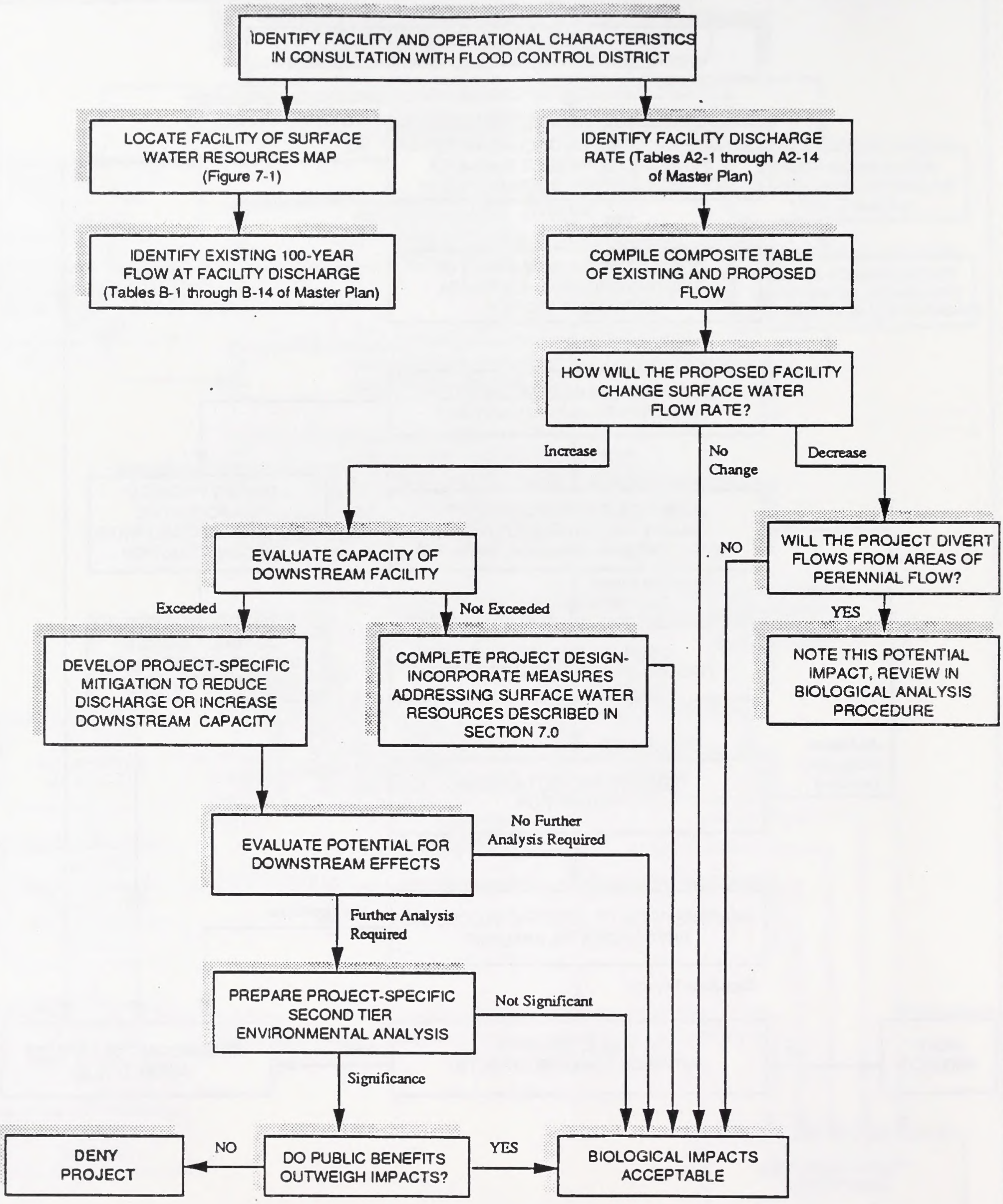

IDENTIFY FACILITY AND OPERATIONAL CHARACTERISTICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
LOCATE FACILITY OF SURFACE WATER RESOURCES MAP (Figure 7-1)
IDENTIFY FACILITY DISCHARGE RATE (Tables A2-1 through A2-14 of Master Plan)
IDENTIFY EXISTING 100-YEAR FLOW AT FACILITY DISCHARGE (Tables B-1 through B-14 of Master Plan)
COMPILE COMPOSITE TABLE OF EXISTING AND PROPOSED FLOW
HOW WILL THE PROPOSED FACILITY CHANGE SURFACE WATER FLOW RATE?
Increase
No Change
Decrease
EVALUATE CAPACITY OF DOWNSTREAM FACILITY
NO
WILL THE PROJECT DIVERT FLOWS FROM AREAS OF PERENNIAL FLOW?
Exceeded
Not Exceeded
YES
DEVELOP PROJECT-SPECIFIC MITIGATION TO REDUCE DISCHARGE OR INCREASE DOWNSTREAM CAPACITY
COMPLETE PROJECT DESIGN-INCORPORATE MEASURES ADDRESSING SURFACE WATER RESOURCES DESCRIBED IN SECTION 7.0
NOTE THIS POTENTIAL IMPACT, REVIEW IN BIOLOGICAL ANALYSIS PROCEDURE
EVALUATE POTENTIAL FOR DOWNSTREAM EFFECTS
No Further Analysis Required
Further Analysis Required
PREPARE PROJECT-SPECIFIC SECOND TIER ENVIRONMENTAL ANALYSIS
Not Significant
Significance
DENY PROJECT
NO
DO PUBLIC BENEFITS OUTWEIGH IMPACTS?
YES
BIOLOGICAL IMPACTS ACCEPTABLE

FIGURE 14-6

PROJECT-SPECIFIC ANALYSIS PROCEDURE
SURFACE WATER RESOURCES

DAMES & MOORE

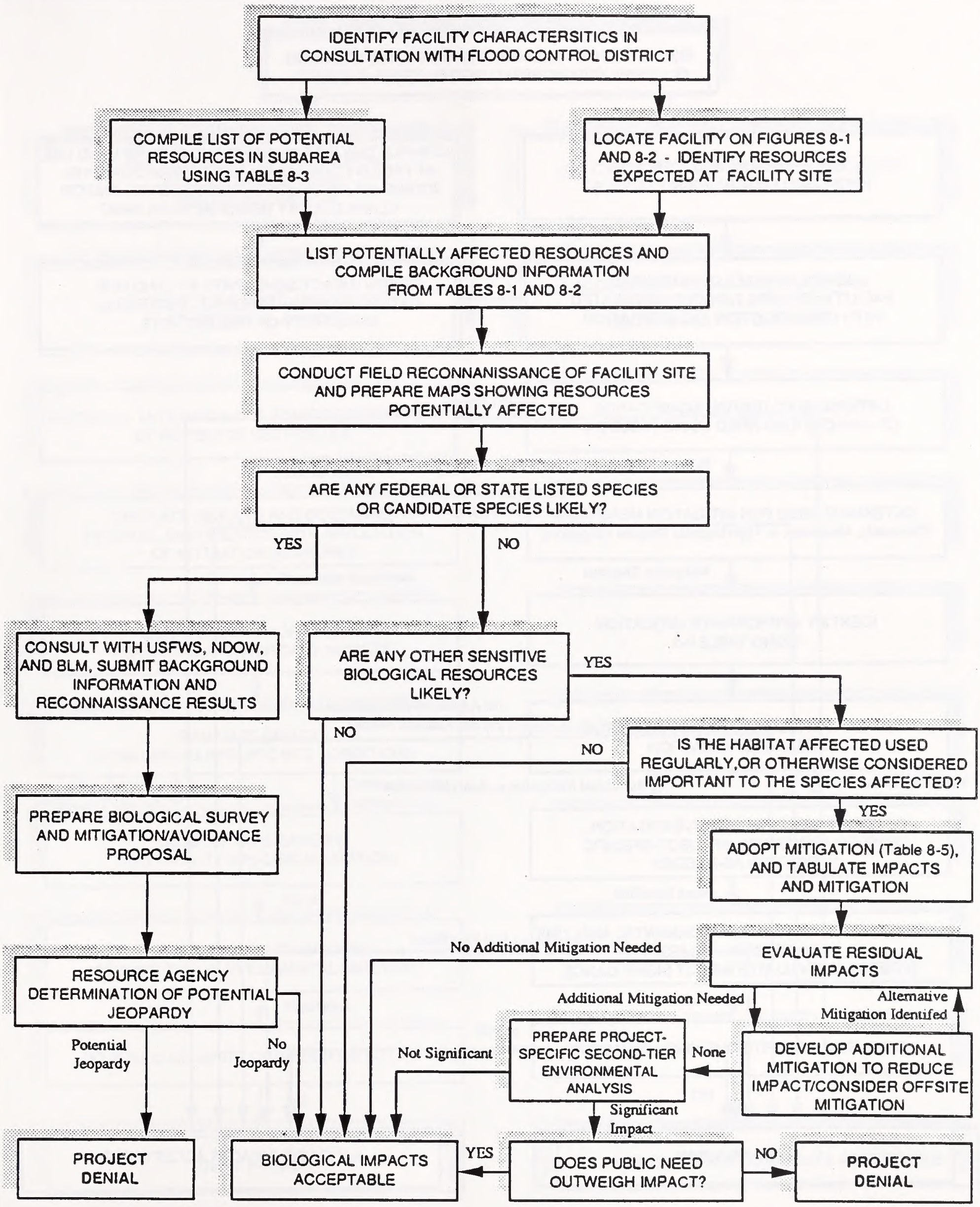

IDENTIFY FACILITY CHARACTERSITICS IN CONSULTATION WITH FLOOD CONTROL DISTRICT
COMPILE LIST OF POTENTIAL RESOURCES IN SUBAREA USING TABLE 8-3
LOCATE FACILITY ON FIGURES 8-1 AND 8-2 - IDENTIFY RESOURCES EXPECTED AT FACILITY SITE
LIST POTENTIALLY AFFECTED RESOURCES AND COMPILE BACKGROUND INFORMATION FROM TABLES 8-1 AND 8-2
CONDUCT FIELD RECONNANISSANCE OF FACILITY SITE AND PREPARE MAPS SHOWING RESOURCES POTENTIALLY AFFECTED
ARE ANY FEDERAL OR STATE LISTED SPECIES OR CANDIDATE SPECIES LIKELY?
YES
NO
CONSULT WITH USFWS, NDOW, AND BLM, SUBMIT BACKGROUND INFORMATION AND RECONNAISSANCE RESULTS
ARE ANY OTHER SENSITIVE BIOLOGICAL RESOURCES LIKELY?
YES
NO
NO
IS THE HABITAT AFFECTED USED REGULARLY,OR OTHERWISE CONSIDERED IMPORTANT TO THE SPECIES AFFECTED?
YES
PREPARE BIOLOGICAL SURVEY AND MITIGATION/AVOIDANCE PROPOSAL
ADOPT MITIGATION (Table 8-5), AND TABULATE IMPACTS AND MITIGATION
No Additional Mitigation Needed
EVALUATE RESIDUAL IMPACTS
RESOURCE AGENCY DETERMINATION OF POTENTIAL JEOPARDY
Additional Mitigation Needed
Alternative Mitigation Identifed
Potential Jeopardy
No Jeopardy
Not Significant
PREPARE PROJECT-SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
None
DEVELOP ADDITIONAL MITIGATION TO REDUCE IMPACT/CONSIDER OFFSITE MITIGATION
Significant Impact
PROJECT DENIAL
BIOLOGICAL IMPACTS ACCEPTABLE
YES
DOES PUBLIC NEED OUTWEIGH IMPACT?
NO
PROJECT DENIAL

FIGURE 14-7

PROJECT-SPECIFIC ANALYSIS PROCEDURE
BIOLOGICAL RESOURCES

DAMES & MOORE

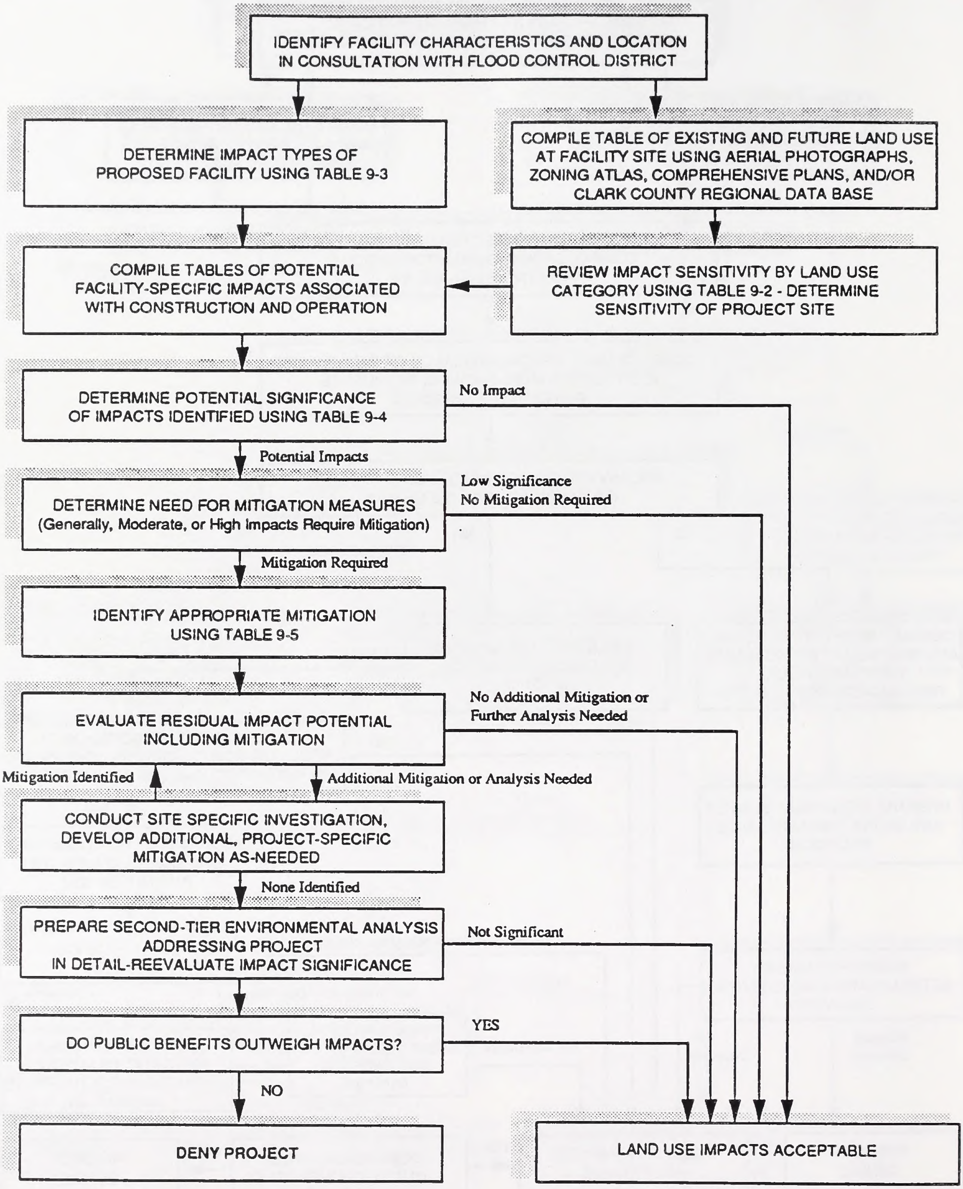

IDENTIFY FACILITY CHARACTERISTICS AND LOCATION IN CONSULTATION WITH FLOOD CONTROL DISTRICT
DETERMINE IMPACT TYPES OF PROPOSED FACILITY USING TABLE 9-3
COMPILE TABLE OF EXISTING AND FUTURE LAND USE AT FACILITY SITE USING AERIAL PHOTOGRAPHS, ZONING ATLAS, COMPREHENSIVE PLANS, AND/OR CLARK COUNTY REGIONAL DATA BASE
COMPILE TABLES OF POTENTIAL FACILITY-SPECIFIC IMPACTS ASSOCIATED WITH CONSTRUCTION AND OPERATION
REVIEW IMPACT SENSITIVITY BY LAND USE CATEGORY USING TABLE 9-2 - DETERMINE SENSITIVITY OF PROJECT SITE
DETERMINE POTENTIAL SIGNIFICANCE OF IMPACTS IDENTIFIED USING TABLE 9-4
No Impact
Potential Impacts
DETERMINE NEED FOR MITIGATION MEASURES (Generally, Moderate, or High Impacts Require Mitigation)
Low Significance No Mitigation Required
Mitigation Required
IDENTIFY APPROPRIATE MITIGATION USING TABLE 9-5
EVALUATE RESIDUAL IMPACT POTENTIAL INCLUDING MITIGATION
No Additional Mitigation or Further Analysis Needed
Mitigation Identified
Additional Mitigation or Analysis Needed
CONDUCT SITE SPECIFIC INVESTIGATION, DEVELOP ADDITIONAL, PROJECT-SPECIFIC MITIGATION AS-NEEDED
None Identified
PREPARE SECOND-TIER ENVIRONMENTAL ANALYSIS ADDRESSING PROJECT IN DETAIL-REEVALUATE IMPACT SIGNIFICANCE
Not Significant
DO PUBLIC BENEFITS OUTWEIGH IMPACTS?
YES
NO
DENY PROJECT
LAND USE IMPACTS ACCEPTABLE

FIGURE 14-8

PROJECT-SPECIFIC ANALYSIS PROCEDURE
LAND USE

DAMES & MOORE

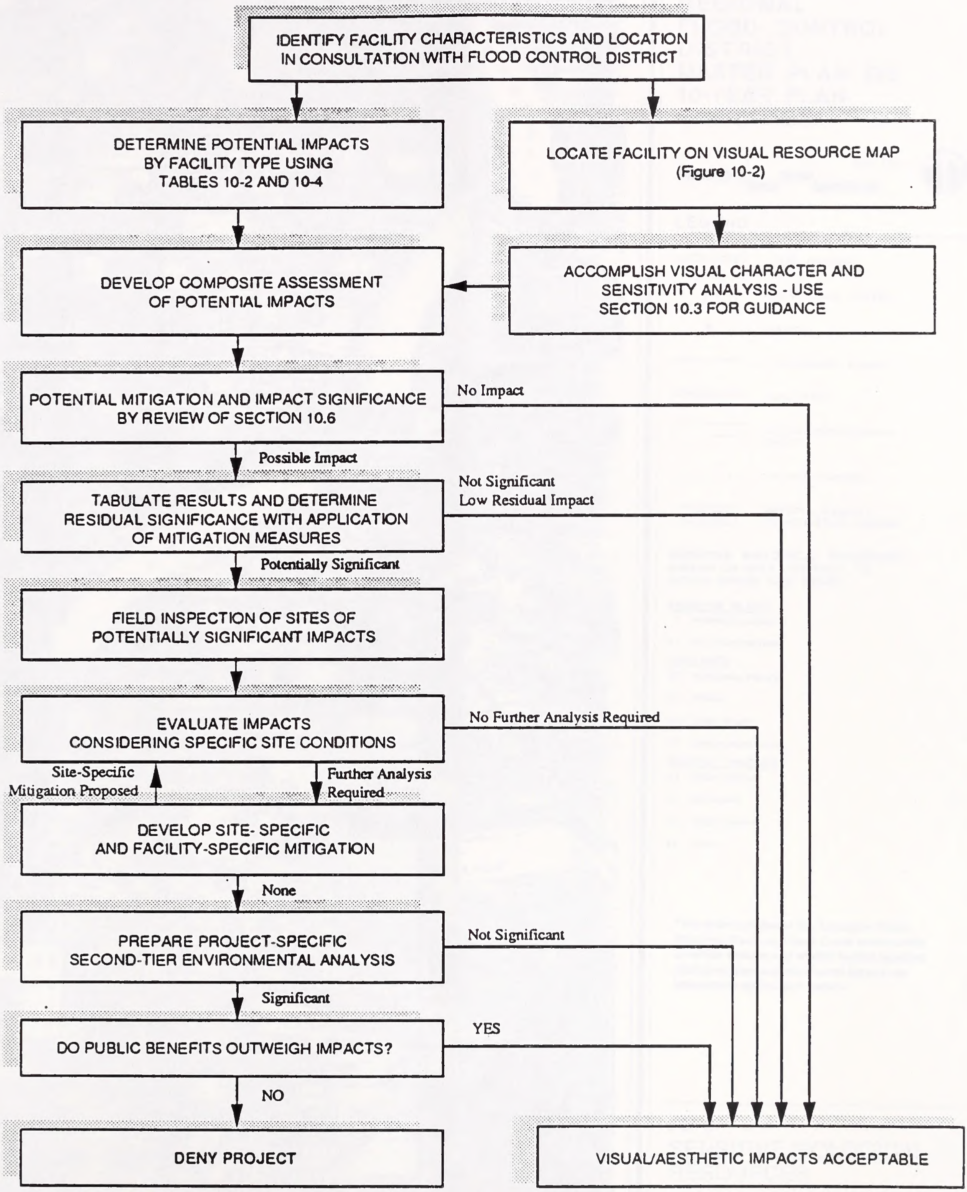
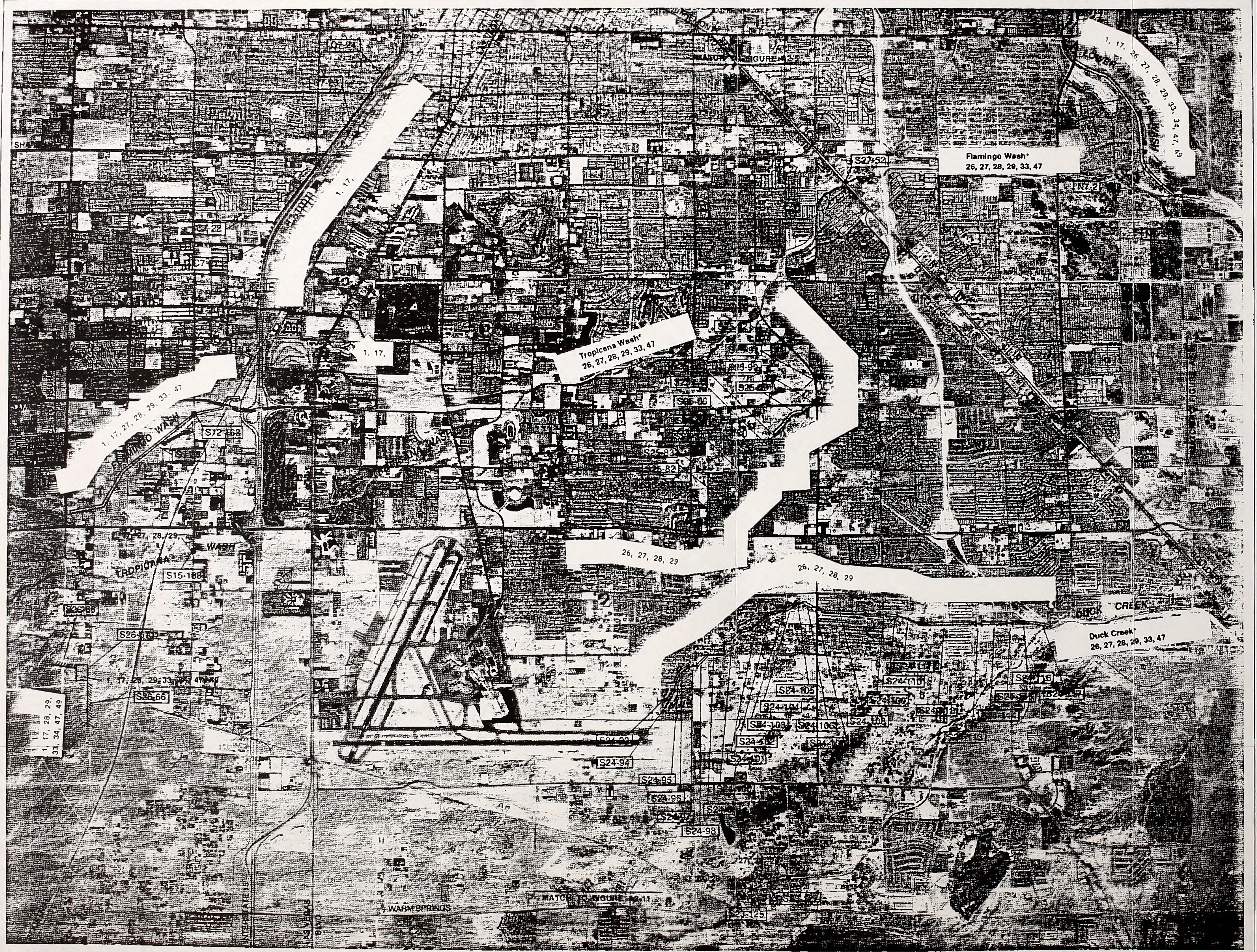

IDENTIFY FACILITY CHARACTERISTICS AND LOCATION IN CONSULTATION WITH FLOOD CONTROL DISTRICT
DETERMINE POTENTIAL IMPACTS BY FACILITY TYPE USING TABLES 10-2 AND 10-4
LOCATE FACILITY ON VISUAL RESOURCE MAP (Figure 10-2)
DEVELOP COMPOSITE ASSESSMENT OF POTENTIAL IMPACTS
ACCOMPLISH VISUAL CHARACTER AND SENSITIVITY ANALYSIS - USE SECTION 10.3 FOR GUIDANCE
POTENTIAL MITIGATION AND IMPACT SIGNIFICANCE BY REVIEW OF SECTION 10.6
No Impact
Possible Impact
TABULATE RESULTS AND DETERMINE RESIDUAL SIGNIFICANCE WITH APPLICATION OF MITIGATION MEASURES
Not Significant
Low Residual Impact
Potentially Significant
FIELD INSPECTION OF SITES OF POTENTIALLY SIGNIFICANT IMPACTS
EVALUATE IMPACTS CONSIDERING SPECIFIC SITE CONDITIONS
No Further Analysis Required
Site-Specific Mitigation Proposed
Further Analysis Required
DEVELOP SITE- SPECIFIC AND FACILITY-SPECIFIC MITIGATION
None
PREPARE PROJECT-SPECIFIC SECOND-TIER ENVIRONMENTAL ANALYSIS
Not Significant
Significant
DO PUBLIC BENEFITS OUTWEIGH IMPACTS?
YES
NO
DENY PROJECT
VISUAL/AESTHETIC IMPACTS ACCEPTABLE

FIGURE 14-9

PROJECT-SPECIFIC ANALYSIS PROCEDURE
VISUAL RESOURCES

DAMES & MOORE



CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT MASTER PLAN EIS 10-YEAR PLAN FACILITIES

0 2 3 4 6000 FEET

LEGEND

═	LINED CHANNEL
⊢⊣	CULVERT/BOX CULVERT
■	BRIDGE
—	PIPELINE/BOX CONDUIT
\\\\\\\\\\	DIKE/LEVEE
▭	DETENTION/RETENTION BASIN
········	UNLINED CHANNEL
N4-25	KEYNOTE (FACILITY/ IDENTIFICATION NUMBER)

SENSITIVE BIOLOGICAL RESOURCES KNOWN OR WITH POTENTIAL TO OCCUR WITHIN THIS PANEL:

SENSITIVE PLANTS

1. *Arctomecon californica*
17. *Arctomecon merriamii*

WETLANDS

26. Herbaceous Wetland
27. Riparian
28. Desert Riparian
29. Saltbush/Mixed Shrub

SENSITIVE WILDLIFE

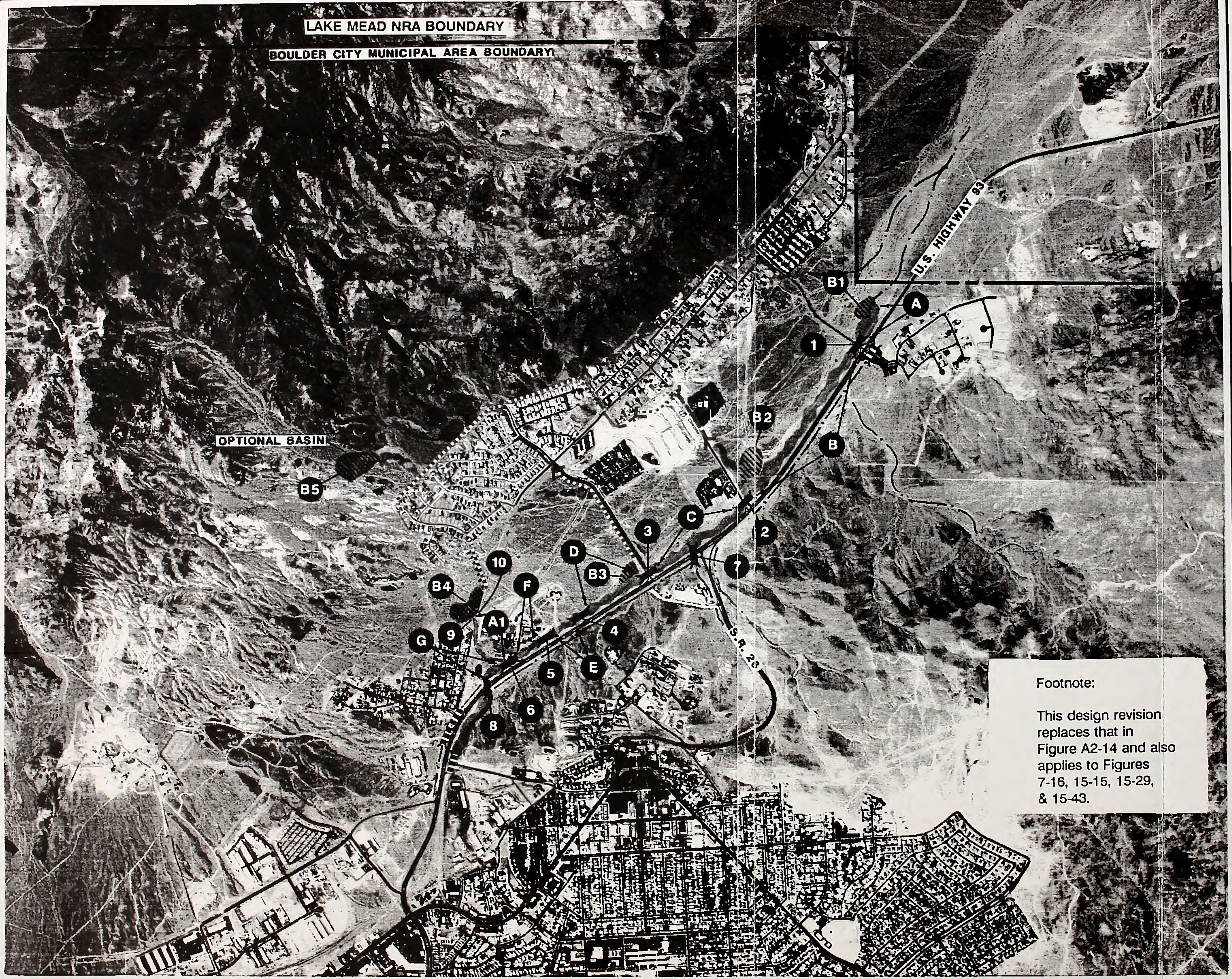
33. Desert Tortoise
34. Gila Monster
47. Desert Cottontail
49. Kit Fox

*The entire lengths of the Tropicana Wash, Flamingo Wash, and Duck Creek contain both sensitive wetland and wildlife habitat together with developed and distributed areas in an intermittent distribution pattern.

A2-8,
SENSITIVE BIOLOGICAL RESOURCES

FIGURE 15-37

DAMES & MOORE



Footnote:

This design revision replaces that in Figure A2-14 and also applies to Figures 7-16, 15-15, 15-29, & 15-43.

CLARK COUNTY
REGIONAL
FLOOD CONTROL DISTRICT

BOULDER CITY FLOOD CONTROL MASTER PLAN

LEGEND

EXISTING

- NATURAL/UNLINED CHANNEL
- LINED CHANNEL
- PIPE/BOX CULVERT
- SEDIMENT BASIN
- DIVERSION DIKE
- STORM DRAIN

PROPOSED

- ARTERIAL COLLECTOR ROAD
- LINEAR GREENBELT/CHANNEL
- LINED CHANNEL
- PIPE/BOX CULVERT
- ▨ DETENTION BASIN
- ▨ SEDIMENT BASIN
- DIRECTION OF FLOW
- DIVERSION DIKE
- STORM DRAIN
- ❶ FACILITIES/STRUCTURES ID. NO.

FIGURE A2-14(b)

Revision to:

RECOMMENDED PLAN
FLOOD CONTROL ALTERNATIVE B

HEMENWAY VALLEY WATERSHED

See legend on following page.

CVL
COE & VAN LOO
PLANNING • ENGINEERING
LANDSCAPE ARCHITECTURE

0 750 1500 2250

NORTH

FIGURE A2-14(b)

LEGEND - FIGURE A2-14(b)

HEMENWAY VALLEY WATERSHED

Structure ID Numbers	100 yr flow -6hr (cfs)	Length (linear feet)	Facilities Description
B1	1680		Energy Dissipator Earthwork, Rip Rap Concrete, etc.
A	1680	625	Trap, S = 5.0%, B = 14', Z = 4, Z = 4, D = 2.6
1	1680	80	Box Culvert, 12' x 8' x 80'
B	1670	2945	Trap, S = 5.0%, B = 14', Z = 0, Z = 4, D = 2.9 Trap, S = 5.0%, B = 14', Z = 4, Z = 4, D = 2.6'
B2	265		Detention Basin, Earthwork Concrete Spillway Rip Rap, Geotextile, etc.
2	1090	70	Box Culvert, 12' x 8' x 70'
C	1090	1735	Trap, S = 5.0%, B = 12', Z = 0, Z = 4, D = 2.5'
3	1100	100	Box Culvert, 12' x 8' x 100'
B3	740		Detention Basin, Earthwork Rip Rap, Spillway
D	530	660	Trap, S = 5.0%, B = 12', Z = 4, Z = 9, D = 1.7'
4	530	32	Box Culvert, 12' x 4' x 32'
E	530	400	Trap, S = 5.0%, B = 12', Z = 4, D = 1.7'
5	530	45	Box Culvert, 12' x 4' x 45'
F	540	680	Trap, S = 3.9%, B = 12', Z = 0, Z = 4, D = 1.8
6	295	25	Box Culvert, 12' x 4' x 25'
G	295	600	Rect., S = 3.5%, B = 12', D = 1.5' Debris Basin, 32,000 cy
A1	210	1300	Main Spillway Channel
9	210	270	48" Outlet Pipe Emergency Spillway
7	405	185	Box Culvert, 12' x 8' x 185'
8	295	165	Box Culvert, 12' x 8' x 165'

LEGEND - FIGURE A2-14(b)

(concluded)

<table>
<tr><th>Structure ID Numbers</th><th>100 yr flow -6hr (cfs)</th><th>Length (linear feet)</th><th>Facilities Description</th></tr>
<tr><td>B5</td><td>---</td><td colspan="2">Optional Detention Basin, Gravel Mining Site, Volume Estimate = 31 Ac.Ft., Q Estimate = 315 cfs
Erosion Resistant Landscaping (Ground cover, shrubs & trees)
Irrigation (Supply lines, drip & spray heads)</td></tr>
</table>

Source: Coe & Van Loo

SECTION 3 - BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE ENHANCEMENT
RENO FIELD STATION
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

August 29, 1990
File No.: 1-5-90-F-25

MEMORANDUM

To: District Manager, Las Vegas District, U. S. Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Reno Field Station, U. S. Fish and Wildlife Service, Reno, Nevada

Subject: Biological Opinion, Clark County Regional Flood Control District's Proposed 10-year Plan for Flood Control Facilities

This Biological Opinion responds to your memorandum dated May 25, 1990, which requested formal consultation with the U. S. Fish and Wildlife Service (Service) pursuant to Section 7 of the Endangered Species Act of 1973, as amended (Act). The Service received your request on May 30, 1990. At issue are the impacts that the granting of rights-of-way permits by the Bureau of Land Management (Bureau) to the Clark County Regional Flood Control District (District) for the construction of flood control facilities may have on the desert tortoise (Gopherus agassizii), a federally listed threatened species.

This Biological Opinion was prepared using the best project description and on-site biological information available at the time of consultation, including: the Biological Assessment for the Proposed 10-year Plan Facilities, Clark County Flood Control Master Plan, prepared by Dames & Moore and dated May 11, 1990; the District's Flood Control Master Plan, dated October 1986; the Administrative Draft of the District's Environmental Impact Statement for the Flood Control Master Plan, dated May 9, 1989; the list of facilities proposed on the District's 10-year construction program as approved June 8, 1989, which was used to determine the Master Plan facilities surveyed for the Biological Assessment; the District's Individual Basins Detailed 10-year Construction Program dated May 25, 1989; the District's fiscal year 1989-90 project list dated June 8, 1989; various reports containing results of tortoise surveys conducted by the Bureau; and information contained in Reno Field Station files.

Biological Opinion

It is our Biological Opinion that the proposed action to issue rights-of-way agreements to the Clark County Regional Flood Control District to construct and operate flood control facilities pursuant to their 10-year Plan is not likely to jeopardize the continued existence of the desert tortoise. Critical habitat has not been designated for the desert tortoise in Nevada. Therefore, no critical habitat will be destroyed or adversely modified by this project.

Project Description

The Clark County Regional Flood Control District's proposed 10-Year Plan analyzed in this Biological Opinion includes facilities that are part of the District's overall Master Plan. These facilities will provide increased flood protection to areas that have already developed or are currently developing in the Las Vegas Valley (Sutko, pers. comm.). The projects include those proposed in the 10-year Plan for the northern, central, and southwest Las Vegas Valley and the towns of Boulder City and Henderson (Appendix A). They do not include those proposed for the town of Mesquite and outlying areas of Bunkerville, Goodsprings, Indian Springs, Laughlin, Moapa Valley, Nelson, and Searchlight because these facilities are not part of the system proposed for the Las Vegas Valley, nor are they interrelated with or interdependent upon that system.

The 10-year Plan analyzed in this Opinion includes 205 individual facilities consisting of 294,500 linear feet (56 miles) of lined and unlined channels, 78,050 linear feet (15 miles) of dikes and levees, 12,870 linear feet (3 miles) of pipelines, 46 box conduits and culverts, 13 bridges, 5 floodways extending 80,000 linear feet (15.1 miles), and 21 detention basins and one debris basin covering approximately 1500 acres. The locations of these facilities are shown on Figures 2-1 through 2-15 of the Biological Assessment dated May 11, 1990. These figures are incorporated into this Opinion by reference. The approximate dimensions of each facility are listed in Appendix A. Although detailed construction plans for individual facilities will be developed during the 10-year program, general descriptions of individual facilities are provided in Volume 1 of the District's Flood Control Master Plan and are incorporated into this Opinion by reference.

The dikes, levees, detention basins and some floodways will be located primarily around the perimeter of the valley. Other facilities will be contained mostly within, or adjacent to, developed areas (Figure 1).

In general, the two unlined channels listed in Appendix A are proposed to be trapezoidal in shape and vary from 6 to 7 feet in depth. Side slopes are generally 3:1. These channels may require drop structures to decrease velocities and minimize erosion. The construction zone is estimated to be an additional 20 feet beyond the proposed width of the channel. Lined channels are trapezoidal in shape and range from 4 to 88 feet in width and 3 to 10 feet in depth. Side slopes range from 1:1 to 3:1. Channel linings are primarily concrete, but soil cement may be used in some areas. The total area disturbed during construction will range from twice the width of the channel for larger facilities to no less than an additional 20 feet beyond channel width for narrow channels.

Floodways are anticipated to be wide bermed, unimproved channels which are maintained. An unimproved access road will be constructed along one side of each floodway. Although vegetation will be allowed to grow in the floodways following construction, these will not be totally natural systems. Width will vary from 300 to 500 feet with depths of 3 to 15 feet. In some areas, a two feet wide by 3 feet deep concrete-lined trapezoidal low flow channel with 2:1 side slopes may be constructed in the center of the floodway. Concrete flow-spreading dikes may also be constructed across the floodway channel at 500 foot intervals. Construction areas for floodways will be approximately 110 percent of the finished width of the floodway.

Dikes are proposed to be trapezoidal in shape and vary from 42 to 72 feet in width and 5 to 10 feet in height. Dikes will have 3:1 side slopes with a 12-foot top for access and maintenance purposes. Eight of the 15 proposed dikes will be unlined, 2 lined on one side, and 5 lined on both sides and the top with concrete. The area disturbed during construction is anticipated to be twice the width of the facility for its full length. Soil for construction will in most cases be obtained by excavating from behind the facility to construct the embankment.

Detention and debris basins range in size from 10 to 200 acres and will be shaped to fit the natural topography. Detention basins include outlet structures and a concrete spillway. Construction areas for basins are anticipated to be 110 percent of the size of the finished facility. Construction yards are usually located in the interior of the basin.

The District has developed general guidelines for operation and maintenance of facilities. Unlined and lined channels as well as floodways are designed to operate passively. These facilities will be inspected annually and following each major storm event. Maintenance is done by the property owner or lead entity responsible for the facility's construction. The District anticipates that maintenance of unlined channels may include periodic use of herbicides, clearing of vegetation, and grading. Maintenance of lined channels may consist of the removal of trash. Maintenance of floodways may include removal of vegetation, surface recontouring, and application of herbicides.

Dikes will be inspected yearly after significant flood or storm events. As with other facilities, maintenance will be done by property owners or the entity responsible for construction.

Areas maintained for detention and debris basins are typically 10 percent larger than the finished basin. Basins and associated structures are designed to operate passively. They are inspected by the District yearly and following major storm events. The entity responsible for construction of the basin is responsible for maintenance which consists of clearing of trash from trash racks and removal of sediments as necessary.

Maintenance of pipelines and box culverts consists of removal of debris from trash racks and clearance of debris from other portions of the facility as required.

The Master Plan also provides further discussion of the overall criteria for alternative formulation, approaches to applying these criteria to specific flooding problems, operation and maintenance criteria, and the manner in which facilities would operate together to solve flooding problems. This information is also incorporated into this Opinion by reference.

The District has prioritized the flood control facilities and developed a 10-year construction program. Implementation of the program is dependent on District revenues and changing hydrologic circumstances, and the scheduling is reevaluated on a yearly basis. The 1989 scheduling program, which is the program we have evaluated, is incorporated into this Opinion by reference. Although some facilities in the 10-Year Plan are scheduled for land acquisition and design only, with construction scheduled beyond the 10-year period, their impacts on the desert tortoise if fully implemented are analyzed in this Opinion.

Although borrow and disposal sites for the Master Plan facilities had not been identified at the time our Opinion was developed, nor were alignments of access roads and locations of construction yards identified, only Bureau authorized community gravel pits or privately owned gravel pits are proposed to be used as off-site sources of construction materials. The District has stated that sites acceptable to the Bureau and the Las Vegas community will be used for the disposal of any excess materials. The District has also indicated that, in many cases, construction staging areas will be located on the sites of the proposed facilities (Sutko, pers. comm.).

To compensate for loss of tortoise habitat associated with this project, the District has proposed to provide $324 per acre of permanent disturbance and $130 per acre of temporary disturbance (40 percent of the assessment for permanent disturbance). Under the 10-Year Plan analyzed in this Opinion, this assessment would result in a compensation of $418,608 for permanent disturbance and $42,627 for temporary disturbance for a total of $461,235. This figure, however, could increase if final design results in larger facilities, or if other facilities are added to the project. One half of the compensation funds would be contributed prior to initiation of construction of any facilities. The remainder would be contributed at the beginning of the second year of construction. The mechanism by which these funds would be handled was not determined at the time this Opinion was written, but the District had agreed verbally to contribute the monies to a fund managed by Clark County through an interlocal agreement with the District. Monies would be used for the conservation of the desert tortoise.

The District also has proposed a series of pre-construction, construction, and post-construction measures to minimize the loss of tortoise habitat and reduce loss and displacement of tortoises. These measures include pre-construction tortoise surveys, marking of burrows, moving tortoises off project sites, monitoring of tortoises during construction, avoidance of burrows where possible, marking of construction areas and reducing disturbance to the extent possible, implementation of a worker education program, and a trash abatement program. The Biological Assessment provides a more detailed description of these proposed measures.

Species Account

On April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (U.S. Fish and Wildlife Service, 1990). The desert tortoise is a large, herbivorous reptile which occurs in parts of the California, Nevada, Arizona, and Utah deserts as well as Sonora and Sinaloa, Mexico. In Nevada, the native range of this species is generally restricted to Clark County and those portions of Nye and Lincoln counties south of 37 North latitude and below approximately 1,330 meters (4,000 feet) elevation. The desert tortoise has declined in numbers during recent years throughout much of its range, including the Las Vegas Valley. Factors contributing to this decline are disease, habitat loss, and predation by common ravens (U.S. Fish and Wildlife Service, 1989).

In Nevada, tortoises are generally active during the spring and early summer when annual plants are most common. Additional activity occurs during warmer fall months and occasionally after summer rainstorms. Tortoises usually spend the remainder of the year in burrows or dens, escaping the extreme weather conditions of the desert. Burrows may be located under bushes, in the banks or beds of washes, in rock outcrops, or in caliche caves.

Studies on the home ranges of tortoises in California indicate that home range depends on age, size, and sex of the tortoise and availability of forage (Berry, 1973). Burge (1977) found that home range of male tortoises near Arden, Nevada (in the vicinity of the project area) averaged 26 hectares (64 acres) for males and 19 hectares (47 acres) for females. This was consistent with results of studies by Turner et al. (1981) and Medica et al. (1982) in Ivanpah Valley in California.

Further information on the range, biology, and ecology of the desert tortoise are found in Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Luckenbach (1982), and Weinstein et al. (1987).

According to site surveys conducted in September and October 1989 by Dames & Moore, environmental consultants, the majority of the proposed flood control facility sites are found in the Mojave creosote bush scrub plant community. This community is usually found on alluvial fans and in valleys below 3500 feet elevation. Dominant plants include creosote bush (Larrea tridentata) and white bursage (Ambrosia dumosa) with significant contributions by four-wing saltbush (Atriplex canescens), Fremont dalea (Dalea fremontia), rattany (Krameria parvifolia), and a variety of other shrubs. Mojave yucca (Yucca schidigera) is found at higher elevations. Many of the sites in this plant community have been disturbed by off-highway vehicle use and dumping of trash. These sites are characterized by few native understory species and an increase in ruderal plant species.

The blackbush scrub/Joshua tree woodland plant community is found at elevations above 3,000 feet. Dominant plants include Joshua tree (Yucca brevifolia), blackbrush (Coleogyne ramosissima), creosote bush, white bursage, Mojave yucca, and Nevada ephedra (Ephedra nevadensis).

Washes within the above plant communities are characterized by Mojave desert wash scrub vegetation. Dominant shrubs include catclaw acacia (Acacia greggii), desert willow (Chilopsis linearis), and mesquite (Prosopis juliflora).

The far western and northwestern portions of the project area are in habitat designated Category 2 by the Bureau on their Interim Tortoise Habitat Category Map. The proposed Upper Blue Diamond Detention Basin and the Kyle Canyon System are located within these areas which are also currently being considered for Desert Tortoise Conservation Areas by the Technical Advisory Committee for the Habitat Conservation Plan for Clark County. These areas have also been recommended for inclusion in the Land Use Plan for the Bureau's Las Vegas District as Areas of Critical Environmental Concern.

Between 1981 and 1989 the Bureau conducted 1.5 mile long triangular transects in the vicinity of some facilities to determine tortoise densities. These showed medium tortoise densities approximately 1 mile south of Duck Detention

Basins #4 and #5 (facilities #S20 and #S21), high densities one-half mile southwest of the West Branch of Duck Creek (near facility #S22), low to medium densities within one-half mile of the site of the Upper Blue Diamond Detention Basin (facility #S11), low densities at the site of the Kyle Canyon facilities, and low to medium densities in the area of West Range Wash (#N10) facilities. Dames and Moore, consultants to the District, conducted 100 percent coverage surveys on all facilities to be located in areas containing habitat that could be occupied by the tortoise. Results of these surveys are shown in Table 1. They also conducted 1.5 mile triangular transects at 7 locations around the north, west, and south perimeter of the valley to assess tortoise densities in areas of potential indirect and cumulative impacts. Locations and results of all surveys are given in the Biological Assessment and are incorporated here by reference.

Effects of the Proposed Project on the Listed Species

Appendix B, Table B-1, lists those facilities that will not adversely affect the desert tortoise. Table B-2 lists those facilities that will have an adverse effect on the species. Construction of the proposed District 10-year plan as specified in the Biological Assessment and in the Construction Program dated May 25, 1989, will directly and permanently destroy 1,290 acres of tortoise habitat and temporarily impact an additional 327.9 acres. Table 1 specifies the amount of acreage affected for each individual structure. The dimensions of the structures are provided in Appendix A. Construction impacts will occur from grading and removal of vegetation, stockpiling of topsoil, excavation of detention basins, debris basins, and channels, lining of channels and basins, clearing of pilot channels in floodways, installation of culverts, conduits and pipelines, and other activities requiring the use of machinery. Habitat used for foraging, breeding, and cover, as well as active and potentially active burrows, dens, and pallets will be permanently lost.

Bureau authorized community gravel pits or privately owned gravel pits will be used by the District as off-site sources of construction materials. These sites, locations to be used for disposal of excess materials, and the alignments of access roads will be developed during the engineering design phase of each given project and are not included in our analysis.

Detention basins will destroy large areas of habitat within the project area, significantly affecting the home ranges of all tortoises which use those sites. Hatchling and juvenile tortoises have very small home ranges which expand as the tortoise matures. Once tortoises have reached a certain size following sexual maturity, home range sizes appear to level off (Barrett, pers. comm.). Linear facilities proposed for this project are not anticipated to significantly affect the home ranges of mature tortoises, but are likely to displace younger animals to areas outside their established home range.

Fourteen dikes will be constructed in or adjacent to tortoise habitat. These facilities will interrupt sheet flows from slopes and the alluvial fan across the desert below the dikes. Interruption of sheet flows will likely cause degradation of habitat over time below the dike if these areas remain undeveloped following facility construction. This conclusion is supported by a 1984 study of the importance of overland runoff and mean annual rainfall to shrub communities of the Mojave Desert (Schlesinger and Jones, 1984).

Table 1. Impacts of 10-Year Plan facilities on the desert tortoise and its habitat

Facil. #	Acres Tortoise Habitat Disturbed	Relative Tort. Density	Anticipated Take[1] Nests	Anticipated Take[1] Tort.
Gowan Road Detention Basin System			0	1
N1-2	1.2	Very low		
N1-3	3.2	Very low		
N1-4	1.6	Very low		
N1-6	0[2]	Very low		
N1-7	0	Very low		
Upper Las Vegas Wash System			2	14
N3-1	87.2	Low		
N3-8	220.0	Low		
North Las Vegas Detention Basin System			1	1
N4-2	0	Very low		
N4-3	0	Very low		
N4-8	60.0	Very low		
N4-22	0	Very low		
N4-23	0	Very low		
N4-24	0	Very low		
Kyle Canyon System			2	12
N5-1	5.8	Low		
N5-2	30.0	Moderate		
N5-3	110.0	Low		
N5-4	6.6	Very high		
N5-5	4.6	Very high		
N5-6	0	Very low		
N5-7	10.0	Low		
West Range Wash System			2	10
N10-9	29.0	Moderate		
N10-10	27.0	Low		
N10-11	115.5	Low		
N10-13	0	Very low		
East Range Wash System			1	2
N12-9	0	Very low		
N12-9 alt	?			
N12-10	5.0	Very low		
N12-11	0.8	High		

Table 1. Impacts of 10-Year Plan facilities on the desert tortoise and its habitat (Continued)

Facil. #	Acres Tortoise Habitat Disturbed	Relative Tort. Density	Anticipated Take Nests	Anticipated Take Tort.
Central Las Vegas Valley				
Angel Park/Gowan Detention Basin Conveyance System			1	2
C1-45	0	Very low		
C2-46	0	Very low		
C2-47	6.8	Moderate		
C2-48	0	Very low		
C2-49	1.8	Very high		
C2-51	1.8	Very low		
C2-52	0.3	Very low		
C2-53	4.6	Moderate		
Gowan Detention Basin			1	3
C3-55	242.0	Very low		
Southwest Las Vegas Valley				
Upper Flamingo Detention Basin System			2	17
S1-59	77.0	Very high		
S2-61	4.6	Very low		
Duck Detention Basin #1 System			2	16
S4-23	0	Very low		
S4-24	137.5	Moderate		
Durango Drive System			0	1
S6-48	0	Very low		
Upper Blue Diamond Detention Basin System			4	32
S11-2	6.6	Very low		
S11-3	143.0	Very high		
Lower Blue Diamond Detention Basin System			0	1
S17-4	0	Very low		
NDOT Detention Basin			0	1
S18-14	0	Very low		
Duck Detention Basin #3			1	1
S19-24	38.5	Very low		
Duck Detention Basin System #4			1	6
S20-17	16.6	Very low		
S20-18	22.0	High		
Duck Detention Basin #5 System			2	17
S21-28	11.6	Very low		
S21-29	82.5	High		

Table 1. Impacts of 10-Year Plan facilities on the desert tortoise and its habitat (Continued)

Facil. #	Acres Tortoise Habitat Disturbed	Relative Tort. Density	Anticipated Take	
			Nests	Tort.
Duck Creek System			1	4
S22-25	40.2	Very low		
Pittman Detention Basin System			1	3
S29-37	6.6	Very low		
S29-38	60.5	Low		
S29-39	5.8	Very low		
S30-45	3.4	Very low	0	1
Boulder City				
Bootleg Canyon System			0	1
B1-4,5	4.2	Very low		
Hemenway Wash/Ville Drive System			1	1
B2-35	0	Very low		
B3-39	1.2	Very low		
B4-36	2.2	Very low		
B4-41	6.8	Very low		
B4-44	14.6	Very low		
Buchanan Boulevard Channel and Buchanan Wash Systems			1	1
B5-21	0	Very low		
B5-22	0	Very low		
4108-23	1.0	Very low		
4108-24	10.4	Very low		
4108-26	11.4	Low		
4108-45	0	Very low		
Cemetery Wash Floodway			1	2
4109-28	19.6	Moderate		
Hemenway Wash System			1	1
4110-30	18.4	Very low		
4110-43	0	Very low		
4110-40	0	Very low		
Debris Basin			1	1
4114-31	11.0	Very low		
Henderson				
Boulder Highway System			1	-
H1-10	1.8	Very low		
H1-11	0	Very low		
H1-12	0	Very low		
H1-13	0	Very low		
H1-14	82.5	Low		

Table 1. Impacts of 10-Year Plan facilities on the desert tortoise and its habitat (Continued)

Facil. #	Acres Tortoise Habitat Disturbed	Relative Tort. Density	Anticipated Take[1]	
			Nests	Tort.
Pittman Wash Channel System			1	1
H3-12	0[2]	Very low		
H3-14	0	Very low		
H3-17	0	Very low		
H3-18	0	Very low		
H3-31	2.0	Very low		
H3-56	10.4	Very low		
Green Valley System			0	1
2618-57	2.6	Very low		
GVBR	0	Very low		
GVBX	0	Very low		
		Total Anticipated Take:	31	157

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[1] Anticipated take of tortoises shown in this table is take resulting from construction activities and was calculated using field survey data provided by Dames and Moore, consultants to the District, from 100 percent coverage of facility sites. A range of tortoise densities was developed from total adjusted sign found on each site. The mid-point of this range was used to calculate the number of tortoises likely to be present on the site and taken during construction activities. To calculate anticipated take of nests, 5 to 10 percent (average 7.5) of a stable population of tortoises is assumed to be breeding females (Marlowe, pers. comm., from unpublished model developed by Gilpin). Each breeding female may lay 0 to 3 clutches (average 1.5) in a season. Facilities less than 10 acres in size with very low tortoise densities were considered to have a nest.

[2] Even though tortoise habitat is not found on a construction site, tortoises from nearby tortoise habitat could wander into the construction area and be harmed.

Diversion of sheet flow and runoff is expected to result in lower shrub density and biomass of creosote bush and bursage. Some shallow rooted annuals and perennials may increase in density, however. It is difficult to quantify this impact, but density of creosote bush and bursage of 66% and 73% after 45 years could occur (Schlesinger and Jones, 1984). This could result in a decline in cover and burrow sites for the tortoise during the life of the project. Forage, however, could increase due to a decline in competition with larger plant species. Based on Dames and Moore surveys, the majority of dikes will divert runoff in areas with very low to moderate tortoise densities. However, approximately 24 square miles of tortoise habitat could be affected if all dikes are constructed prior to other development in the area. An additional 2.2 square miles may be similarly affected through construction of channel N5-7 in the Kyle Canyon system. Although difficult to predict, the District anticipates that facility construction will generally take place concurrently with or follow, not precede, residential and commercial development. Therefore it is anticipated that in most cases dikes and other facilities will be constructed adjacent to habitat that has already been severely altered by development.

The dikes may also form a barrier to some degree to tortoise movement in the area. Although dike side slopes will be at a 3:1 ratio, which should preclude tortoise movement from one side to the other, the dikes may direct some tortoise movement along the base of the structure.

Lined channels with side slopes ranging from 1:1 to 3:1 may also serve as barriers to tortoise movement. Although tortoises would be able to cross the channels, particularly where side slopes are 3:1, some may have difficulty finding their way out. The lack of cover in the channels may make tortoises more vulnerable to predation, particularly by ravens. These factors are anticipated to be most evident in channel facilities N5-4 and N5-5 in the Kyle Canyon system where channels are concrete lined with 2:1 side slopes and depths range from 6 to 8 feet. Construction of these channels will in effect isolate tortoises within an approximately 2 square mile area bounded by the two channels on the north and south, U.S. Route 95 on the east, and the Kyle Canyon Detention Basin to the west.

Construction of the system of channels and floodways would reduce water flows in some remaining desert washes through diversion of their natural flows. Wash vegetation composition and densities, including a decline in germination of annuals frequently found in this habitat, is expected to occur. Because desert annuals are an important food source for tortoises, this impact would negatively affect the tortoise.

Several additional indirect or difficult to quantify adverse impacts to the desert tortoise and its habitat are as follows:

o Construction activities, such as workers and equipment damaging vegetation or crushing tortoises and/or burrows outside of the construction area, could result in an unforeseeable number of tortoises being killed. Tortoises may also wander onto the construction site and be harmed.

o Noise generated from construction equipment may reduce the ability of tortoises to detect predators or mates in the near vicinity of the facility sites.

- Development of the facilities will fragment the habitat and increase edge, thereby modifying distribution and dispersal patterns and possibly making tortoises more vulnerable to predation as has been shown for other species (Yahner, 1989).

- Trash and debris associated with construction may accumulate and attract such predators as ravens, kit foxes, and coyotes. Ravens in particular are serious predators on juvenile tortoises (Farrell, 1989).

- During rainstorms, silt from construction sites may move into desert washes and smother vegetation used for forage by the tortoise or even fill burrows, particularly if runoff from construction sites is significantly increased as a result of vegetation removal.

- Operation of the flood control facilities may result in trapping of tortoises in detention basins, floodways and channels during storm events. Tortoises may be unable to escape and may drown in floodwaters.

- Maintenance activities may result in crushing of tortoises by heavy equipment. Use of herbicides in channel and floodway maintenance may also be harmful to tortoises, particularly those in a weakened condition due to drought stress or disease.

Tortoise subpopulations may be isolated to some extent by some linear facilities, thereby reducing gene flow among these populations. Consideration must therefore be given to whether or not the existing undeveloped north and west corridors around the Las Vegas Valley are effective and important to maintenance of tortoise populations overall. Current thinking on this issue is that the corridor is presently ineffective due in part to its narrow width and to urban impacts associated with Las Vegas growth (Brussard, pers. comm., and Barrett, 1990). Gene flow which occurs through the area at the present time is likely negligible. The corridor may actually provide an avenue for spread of upper respiratory disease syndrome (Brussard, pers. comm.).

Although some facilities in tortoise habitat are located in areas where tortoise densities are moderate to very high, most are proposed for areas where densities are low to very low (Table 1). Urbanization of the Las Vegas Valley has led to a steady degradation of habitat over the years, and even undeveloped outlying areas within the project boundaries have experienced direct and indirect impacts from dumping of trash, off-highway vehicle use, a declining water table, and other effects of man's activities (U.S. Fish and Wildlife Service, 1990). Although habitat permanently lost as a result of the proposed action is equivalent to approximtely one per cent with temporary loss or degradation of an additional 0.2 percent of the Las Vegas Valley and Boulder City areas, because of past degradation and ongoing urbanization of the valley, we consider most facilities to be proposed for areas that essentially cannot now and will not in the future be able to support a viable and thriving population of tortoises. Those tortoises on the western edges of the valley, however, may be able to survive over the long term if appropriate planning and conservation measures are implemented. These animals represent a small fraction of the population as a whole.

Based on our analysis of current conditions, the Service considers the impacts of construction, operation, and maintenance of the District's 10-Year Plan facilities to not reduce appreciably the likelihood of both survival and recovery of the desert tortoise in the wild. Removal of tortoises found on proposed facility sites represents a small impact to the wild Mojave desert tortoise population when consideration is given to the numbers and geographical extent of the population as a whole. Furthermore, the District's proposal to provide monies to a fund to be used to further the conservation of the tortoise and to implement measures to reduce take of individual tortoises during construction will mitigate and compensate for these impacts.

In order to conserve and protect the tortoise and its habitat over the long term, conservation areas must be set aside for this purpose. The importance of areas on the west side of the valley to the future of the tortoise is presently being evaluated through the Habitat Conervation Planning process. Should new information, future study and planning designate areas within the overall project boundaries, such as those proposed for the Blue Diamond Detention Basin and Kyle Canyon facilities, as desert tortoise conservation areas or as areas necessary for the recovery of the species, the conclusions of our analysis of impacts may require reevaluation.

Cumulative Effects

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered and threatened species or critical habitat that are reasonably certain to occur during the course of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in Section 7 of the Act and, therefore, are not considered cumulative to the proposed action.

The action area associated with this proposed project is the north, central, and southwest Las Vegas Valley, and the cities of Henderson and Boulder City. A large portion of the land in the project area is Federal land managed by the Bureau of Land Management. Any future activities on these lands will be subject to Section 7 consultation. This would likely include any sand and gravel operations used as material borrow sites associated with construction of the flood control project. Certain actions on public lands, such as livestock use in unauthorized areas, off-highway vehicle use not associated with organized events, and dumping of trash are difficult to control and may contribute to continued habitat loss and degradation.

Private lands exist throughout the action area. We estimate that at least two-thirds of the area in which the flood control project will be developed is privately owned. The development of private lands and associated loss of tortoise habitat in the Las Vegas Valley is anticipated to continue, although the extent to which this will occur is uncertain due to the potential for inadequate water supplies. Clark County is presently developing a Desert Tortoise Habitat Conservation Plan (HCP), which is required as part of the application documentation for a Section 10(a) permit for incidental take under the Act. This permit would apply to desert tortoises found on private property within a specified portion of Clark County. The permit application, including the HCP, will be the subject of formal Section 7 consultation prior to issuance of the permit. If a Section 10(a) permit is issued, all construction in Clark County would be required to conform to the conditions set forth in the HCP to ensure compliance with Section 9 of the Act. It is anticipated that the plan will, among other stipulations, establish a per acre fee to mitigate for the loss of habitat. These funds would be utilized to carry out the provisions of the HCP, which may include securing desert tortoise habitats outside of the urban areas of Clark County, and funding management and research.

Incidental Take

Section 9 of the Act, as amended, prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Under the terms of Sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with this incidental take statement. The measures described below are non discretionary and must be undertaken by the agency or made a binding condition of any grant or permit issued to the applicant, as appropriate.

Based on the analysis of impacts provided above, the Service anticipates that the following take could occur as a result of the activities associated with construction, operation, and maintenance of the Clark County Regional Flood Control District 10-year Plan:

1. Twenty-six (26) tortoises may be taken in the form of direct mortality through accidental deaths during construction as a result of tortoises wandering onto the sites from adjacent areas.

2. One hundred fifteen (115) tortoises may be taken in the form of harassment through the removal of tortoises a) excavated from burrows, and b) found above ground within the construction zone during construction activities on detention and debris basin sites and removed from the wild. The level of take anticipated for structures within each individual flood control facility system is specified in Table 1.

3. Forty-two (42) tortoises may be taken in the form of harrassment through the removal of tortoises a) excavated from burrows, and b) found above ground within the construction zone during construction activities on other sites and either relocated to an adjacent area or removed from the wild. The level of take anticipated for structures within each individual flood control facility system is specified in Table 1.

4. Thirty-one (31) nests containing an unquantifiable number of tortoise eggs may be taken during construction activities. The level of take of nests anticipated for structures within each individual flood control facility system is specified in Table 1.

5. An unquantifiable number of tortoises may be taken in the form of indirect mortality through predation by ravens drawn to trash on the construction sites.

6. An unquantifiable number of tortoises may be taken indirectly in

the form of harm through fragmentation of habitat, degradation of habitat below dikes and large channels, dikes and channels serving as barriers to tortoise movement, and increased noise associated with operation of construction equipment.

7. Twenty (20) tortoises may be taken in the form of direct mortality through accidental death due to entrapment in facilities during major flood events during the life of the project.

8. Forty (40) tortoises may be taken in the form of direct mortality through accidental death due to maintenance of facilities during the life of the project.

9. 1,290 acres of tortoise habitat will be permanently destroyed and 327.9 acres temporarily degraded due to construction activities.

Reasonable and Prudent Measures

The Service considers that the following reasonable and prudent measures are necessary and appropriate to minimize the take authorized by this Biological Opinion. This Opinion does not authorize take in the form of the collection of tortoises for pets except as specified through an approved adoption program.

1. Measures shall be implemented to minimize habitat disturbance and to prevent tortoises from being killed or harassed by pre-construction or construction activities.

2. Special precautions shall be taken to reduce attraction of ravens to construction areas.

3. Measures shall be implemented to minimize tortoise mortality due to operation and maintenance of the flood control facility.

4. Measures shall be implemented to facilitate movement of tortoises across linear facilities.

5. Measures shall be implemented to mitigate for temporary and permanent take of habitat.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, the Bureau of Land Management, through the applicant, the Clark County Regional Flood Control District, is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions apply only to those areas listed in Table B-2 of Appendix B of this Opinion and do not apply to areas listed in Table B-1 of Appendix B. Should the District consider the terms and conditions specified in this Opinion no longer appropriate for a facility site because development or other factors in the area may have extirpated tortoises from the facility site and the surrounding area, the Bureau must consult with the Service for our concurrence prior to the District or its designee proceeding with pre-construction or construction activities in order to obtain release in writing from these terms and conditions.

1. To implement reasonable and prudent measure number 1, the following terms and conditions shall be implemented:

a. The Bureau through the District shall designate an individual as a contact representative who will be responsible for overseeing compliance with protective stipulations for the desert tortoise and coordination with the Bureau and the Service.

b. All pre-construction activities which could take tortoises in any manner (e.g., driving off an established road; topographic, property, or boundary surveys; geotechnical investigations; construction layout) shall occur under the supervision of a qualified biologist. The biologist shall accompany each work crew to ensure that tortoises, burrows, and habitat are not disturbed during these activities. Survey markers, equipment used in procedures, excavation sites used in foundation and materials trenching, and other activities shall be sited a minimum of 25 feet away from tortoise burrows. Vegetation shall be avoided to the extent possible. Soil excavated from trenches shall be stockpiled in disturbed areas that are free of tortoise burrows, and the trenches filled before the end of the work day. Except in the event of an emergency involving human health and safety, the following measures shall be adhered to. Vehicular traffic in tortoise habitat areas shall be restricted to existing graded roads and shall not exceed 10 miles per hour. If a tortoise should wander into a work area or the path of a vehicle, work or travel shall stop until the tortoise has moved safely out of harms way before continuing. The ground beneath any vehicle parked in areas occupied by the desert tortoise shall be carefully searched for tortoises before the vehicle is moved. If a tortoise is found beneath a vehicle and has not moved out of harms way of its own volition within 15 minutes, the biologist shall move it according to the protocol specified in Appendix C.

c. Prior to start of pre-construction and construction activities in any areas occupied by the desert tortoise or in which tortoise habitat is found, all present and future employees who will work in such areas shall be informed, through an educational program developed by the Bureau through the District, of the occurrence of the desert tortoise in the project area and of the threatened status of the species. They shall be advised of the definition of "take", the potential for impacts to the tortoise, and the potential penalties (up to $25,000 in fines and 6 months in prison) for taking a threatened species. They shall also be informed of the terms and conditions included in this Biological Opinion. The contents of the education program shall be submitted to the Service for review and approval prior to its implementation. The program shall also be presented to all supervisory personnel, supervisory and maintenance personnel associated with maintenance activities in tortoise habitat, and private landowners who will be responsible for maintenance of facilities on their properties. All such persons shall sign a statement indicating that they have completed the education program and understand fully its provisions and the terms and conditions included in this Biological Opinion.

d. Within 60 days prior to initial brushing, grubbing, grading, or other construction activity, a thorough survey of the construction site, including areas outside the facility boundaries likely to be disturbed by construction activities, shall be conducted by a qualified biologist. All tortoise burrows, and burrows and dens of other species that could be occupied by tortoises, shall be conspicuously flagged.

e. Temporary tortoise proof fencing shall be erected around each of the following facilities prior to beginning construction activities: N3-8; N4-8; N5-1,2,3,4,5,6; N10-9, 10, 11; N12-9,10,11; C1-45; C2-46,47,48,49,52,53; S1-59; S2-81; S4-23,24; S20-17; S21-28,29; S22-25; 4109-28. A qualified biologist shall supervise the erection of the fence. All tortoise burrows and other burrows and dens that could be occupied by tortoises within the fence construction zone shall be excavated by hand. All tortoises, including any eggs found, shall be removed from the fence construction zone according to the protocol provided in Appendix C prior to brush removal, grading, and fence installation.

f. Following installation of any fence, the authorized tortoise biologist(s) shall carefully examine the entire project right-of-way inside of the fence for tortoises. Each burrow, whether showing evidence of activity or not, shall be 1) either examined using a fiberoptiscope and, if a tortoise is present, excavated by hand to remove the tortoise, or 2) excavated by hand to remove any tortoise or eggs that may be present. Burrows or dens of other species that could be used by tortoises shall also be treated in the same manner. Tortoises found in these areas shall be handled and moved out of the construction zone according to the protocol provided in Appendix C. All burrows shall be excavated under the supervision of the biologist. Only the biologist shall handle tortoises or tortoise eggs.

g. In all other areas where tortoises may be found (facilities listed in Table B-2 with the exception of those listed in condition 1.e.), the District has the option of complying with one of the following terms and conditions:

EITHER
1) The facility shall be fenced with temporary tortoise-proof fencing prior to construction as specified in conditions 1.e. and 1.f. above, OR

2) The construction area boundary shall be flagged under the supervision of the biologist with conspicuous flagging using a color different than that used to flag burrows. All burrows shall be excavated by hand under the supervision of the biologist and tortoises removed from the site following the protocol provided in Appendix C. All construction activities shall take place with a biologist on site at all times. The biologist shall be responsible for moving any tortoises that wander into the construction area according to the protocol specified in Appendix C.

h. Should properties around these facilities become developed prior to facility construction to the extent that tortoises no longer occupy the surrounding areas, conditions 1.e., 1.f., and 1.g. may not need to be implemented if the Service concurs following consultation as specified above. The facility sites, however, shall be thoroughly searched by a qualified biologist prior to construction to determine if any tortoises are present. If a tortoise is found, it shall be removed according to the protocol provided in Appendix C.

i. Tortoises removed from all detention and debris basin sites under 1.e., 1.f., 1.g., or 1.h. above shall be: 1) provided to research or translocation projects approved and permitted by the Service; 2) provided to educational facilities holding appropriate State and Federal permits; or 3) made available for adoption. The Service recommends that potential recipients of tortoises meet the guidelines developed by the TORT Group. These guidelines are available from TORT at (702) 739-7113. Should facilities not meet the criteria recommended by TORT, the Service is concerned that the tortoise would not be cared for in a humane fashion. If the tortoise cannot be placed in one of these programs, it may be disposed of humanely through euthanasia by a qualified veterinarian or a biologist licensed to do so. A report describing the disposition of the animal, and pertinent information regarding the tortoise as required in the protocol described in Appendix C, shall be provided to the Service within 60 days.

This condition is not meant to imply that the Service favors euthanization of tortoises. We recognize, however, the concerns for tortoises held in captivity under possibly unfavorable circumstances. We continue to work to find a more acceptable way to resolve this serious issue.

j. Tortoises found on all other sites other than those listed in condition 1.h. shall be moved off the construction site for a distance of 150 to 300 feet and placed in the shade of a shrub or in a natural unoccupied burrow similar to the hibernaculum in which it was found or in an artificially constructed burrow following the protocol provided in Appendix C. Tortoises shall not be placed on lands not under the ownership of the Bureau or the Flood Control District without the written permission of the landowner. If such permission is not obtained, the tortoise shall be handled under procedures outlined in 1.i. above. Tortoises showing symptoms of Upper Respiratory Disease Syndrome shall be left in the wild after gathering data specified in Appendix A unless found at the sites of the following facilities which are located on the outer fringes of the action area: N5-1,2,3,4,5,6; N3-1; N10-9; N12-9,10,11; S11-2,3; S4-23,24,25; S20-17,18; S21-28,29; 4109-28. Tortoises with Upper Respiratory Disease Syndrome found at these sites shall be treated as specified in condition 1.i. above.

k. All vehicle traffic during construction shall be restricted to existing roadways and to areas that have been cleared of tortoises. Speed limits in undeveloped areas containing tortoise habitat shall not exceed 10 miles per hour from March 1 to November 15 of any year, except in emergency situations involving human health and safety. Information shall be provided to construction crews and other workers regarding areas where vehicular traffic is not allowed. The ground beneath any vehicle parked in areas occupied by the desert tortoise outside of sites fenced with tortoise proof fencing shall be carefully searched for tortoises before the vehicle is moved. If a tortoise is found beneath a vehicle and has not moved out of harms way of its own volition within 15 minutes, then the biologist shall move it according to the protocol specified in Appendix C.

2. To implement reasonable and prudent measure number 2, the following term and condition shall be implemented:

a. The District and/or its designee shall implement a litter control program during construction that will include the use of covered, raven-proof trash receptacles, removal of trash from the construction site to the trash receptacles following the close of each work day, and proper disposal of trash in a designated solid waste disposal facility at the end of each work week.

3. To implement reasonable and prudent measure number 3, the following term and condition shall be implemented:

a. Permanent tortoise proof fencing shall be erected around each of the following facilities. This fencing may be substituted for temporary fencing specified in condition 1.e. above prior to construction at the discretion of the District or its designee. The facilities are: N5-2,4,5; C2-46,47,48,49,52,53; N12-11 and the south and east sides of N12-9; S2-81.

b. Prior to maintenance activities at any facility in tortoise habitat that is not permanently fenced, a qualified biologist shall conduct a thorough survey of the facility and flag all tortoise burrows found within the area in which maintenance activities will take place. If the maintenance is to occur between November 1 and March 15, burrows shall either be completely avoided or the burrows dug out and hibernating tortoises moved as specified in Appendix C. If the maintenance is to occur between March 1 and November 15, a biologist shall accompany the maintenance crew and move all tortoises to safety that would be affected by the activity as specified in Appendix C.

c. Herbicides shall not be used in or adjacent to any facilities located in areas occupied by the desert tortoise unless approved in writing by the Service.

d. All permanent tortoise proof fences shall be monitored regularly, including at least twice yearly and following major storm events, by appropriate maintenance crews, and maintained by responsible agencies for the life of the project. Monitoring and maintenance shall include, but not be limited to, regular observations to determine whether trash, sediment accumulation, or erosion is compromising the fence's function. Any indications of failure of the fence shall be reported to the Service and the fence repaired within 30 days of its finding.

e. Maintenance crews which locate a tortoise that is trapped or found dead in any flood control facility shall immediately notify the Service's Law Enforcement Division for instructions on the proper disposition of the tortoise. If a live tortoise is in imminent danger of harm within a facility, a maintenance crew member may move the tortoise out of harms way using methods provided in the training program.

4. To implement reasonable and prudent measure number 4, the Bureau through the District has the option of implementing one of the following conditions:

EITHER

a. Walkways to provide means by which tortoises can easily move from one side of a flood control channel to another shall be constructed at intervals of approximately every one-half mile over the following facilities:

N5-4 and N5-5. The walkways shall be constructed according to the specifications provided in Appendix D.

OR

b. The channels (N5-4,5) and Kyle Canyon Detention Basin (N5-3) shall be redesigned in consultation with the Service to provide shallow channels with side slopes no steeper than 3:1 and a basin with greater capacity and slower water release rates.

OR

C. N5-1,2,3,4, and 5 shall be moved east of U.S. Route 95 (Tonopah Highway).

5. To implement reasonable and prudent measure #5, the following terms and conditions shall be implemented:

a. To mitigate for the incidental take of habitat lost to construction, the District shall provide $324/acre of permanently lost habitat and $130/acre of temporarily disturbed habitat for a total of $461,235 (before adjustment for inflation). These monies shall be paid into a fund established through an interlocal agreement to be developed between the District and Clark County and shall be used for desert tortoise habitat acquisition and management (can include habitat acquisition, acquisition and retirement of grazing privileges, fencing, etc.) or implementation of any approved Habitat Conservation Plan developed by Clark County. None of these funds shall be used to develop the Habitat Conservation Plan, however. These funds are independent of any other fees collected by the County for desert tortoise conservation planning. These funds shall be held in an interest bearing account, and the accrued interest also shall be expended on desert tortoise conservation measures. Proposed expenditures shall be approved by the Service. One-half of the monies shall be paid prior to construction of the first facility; the remainder shall be paid either at the beginning of the following fiscal year or paid in yearly installments over a 10-year period with the amount adjusted for inflation. Should the funds not be expended on desert tortoise conservation measures approved by the Service within two years of their placement in the account established under the interlocal agreement for desert tortoise conservation, then these funds shall be transferred to The Nature Conservancy for such purposes.

b. The District shall implement a revegetation program for temporarily disturbed sites in areas adjacent to tortoise habitat as specified in Appendix E.

Reporting Requirements

In the event that a dead, injured, or sick desert tortoise is located, initial notification shall be made to the Service's Division of Law Enforcement, Special Agent Edward Dominguez, in Las Vegas, Nevada, at (702) 388-6380. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement consistent with the provisions of this incidental take statement. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. All tortoise remains shall be frozen immediately and provided to one of the following institutions holding appropriate Federal and State permits per their instructions:

Museum of Vertebrate Zoology, University of California, Berkeley, California
Los Angeles County Museum of Natural History, Los Angeles, California
San Bernardino County Museum, San Bernardino, California
University of Nevada Department of Biology, Las Vegas, Nevada
University of New Mexico, Albuquerque, New Mexico

Arrangements shall be made with the institution by the Bureau through a biologist prior to construction regarding proper disposition of potential museum specimens. Should none of the above institutions want the tortoise specimens, the remains may be disposed of in any appropriate manner. In conjunction with the care of sick or injured tortoises, or the preservation of biological materials associated with a tortoise carcass, the Bureau through the District has the responsibility to ensure that information relative to the date, time, and location of the tortoise when found, possible cause of injury or death of the animal, and other pertinent information be recorded and provided to the Service. Should injured animals be treated by a veterinarian and survive, the Service should be contacted regarding the final disposition of these tortoises. The Service contact person is Mary Jo Elpers.

The District through the Bureau shall notify the Reno Field Station of all tortoises killed, injured, or removed from the project site within three days of each occurrence. Within one month following each years construction activities, the District through the Bureau shall provide the Service with a report detailing all tortoise related activities undertaken in association with this project, including tortoise biologist activities, actual numbers of tortoises moved, and effectiveness of the terms and conditions provided in this Opinion.

If, during the course of the action, the incidental take authorized by this Opinion is met, the District shall immediately cease those activities which may result in additional take and so inform the Bureau. The Bureau must reinitiate consultation with the Service immediately to avoid violation of Section 9 of the Act. Operations must not proceed in the interim period between reinitiation and completion of the new consultation if it is determined that additional take will cause an irreversible and adverse impact to the species, as required by CFR 402.14(i). The District should provide the Service with a full explanation of the causes of take resulting from activities up to the time of re-initiation.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term conservation recommendations has been defined as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's Section 7(a)(1) responsibility for these species.

1. Because a significant percentage of the habitat occupied by the desert

tortoise is on public lands, the Bureau should undertake a cumulative effects analysis of its actions on the desert tortoise throughout its range. This program could include development of a model to assess the effects of past, ongoing, and future projects on the tortoise and its habitat through the use of the Geographical Information System (GIS).

2. The Bureau should provide increased numbers of rangers to patrol public lands in southern Nevada for the purposes of enforcing Bureau restrictions on dumping of trash, unauthorized off-road vehicle use, unauthorized disposal of hazardous waste materials, and other ongoing problems that conflict with protection of the tortoise and its habitat.

3. The Bureau should encourage Clark County and the cities therein to consider habitat for the desert tortoise in future planning for areas outside Las Vegas Valley, restricting development to those areas where tortoises and tortoise habitat are not found or have already been severely and irreversibly degraded in the past.

In order for the Service to be kept informed of actions that either minimize or avoid adverse impacts, or that benefit listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Conclusion

This concludes formal consultation on the action outlined in your May 25, 1990, request. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: 1) the amount or extent of incidental take is reached, 2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this Opinion, 3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this Opinion, and 4) a new species is listed or critical habitat designated that may be affected by the action. For example, changes to the 10-Year Plan that add additional facilities to the 10-year construction program, or changes to the location or size of facilities analyzed in this Opinion, or establishment of contruction yards or staging areas to the extent that additional take of tortoises or their habitat could occur, may require reinitiation of consultation. Approval of a Habitat Conservation Plan and a Section 10(a) permit for lands associated with the flood control facilities covered in the Opinion may also require reinitiation of consultation to determine how one affects the other.

We appreciate the assistance and cooperation of your staff and the staff of the Clark County Regional Flood Control District throughout this consultation process. If we can be of further assistance, please contact me or Mary Jo Elpers at FTS 470-5227.

David L. Harlow

Enclosures

cc: Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon (FWE-ES)
Chief, Division of Habitat Conservation, Arlington, Virginia
Senior Resident Agent, Division of Law Enforcement, Reno, Nevada
Special Agent, Division of Law Enforcement, Las Vegas, Nevada
State Director, Bureau of Land Management, Reno, Nevada
Clark County Regional Flood Control District, Las Vegas, Nevada

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APPENDIX A

LIST OF 10-YEAR FACILITIES.

FIGURE NUMBER MASTER PLAN	HIO ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-1	2-2	1	N5*p	2111		Dike	42'w x 5'h, ul	3,000 LF	
A2-1	2-2	2	N5*p	2100		Dike	42'w x 5'h, ul	15,600 LF	
A2-1	2-2	3	N5*p	2101		Det. Basin	1,500 acre-ft	100 AC	Kyle Canyon Det. Basin
A2-1	2-2	4	N5*p	2112		Channel	15'w x 6'd, cl	9,600 LF	Det. Basin Overflow Structure
A2-1	2-2	5	N5*p	2102		Channel	20'w x 8'd, cl	5,000 LF	
A2-1	2-2	6	N5*p	2103		Box Culvert	10'w x 8'd, rc, (double)	240 LF	
A2-1	2-2	7	N5*p	2104		Channel	20'w x 8'd, cl	11,000 LF	
A2-1	2-2	8	N3	2105		Channel/Dike	100'w x 10'd, cl/[1]	7,000 LF	Kyle Diversion Structure
A2-2	2-3	1	N3	2106		Floodway	Width 300-500'[2]	38,000 LF	
A2-2	2-3	2	N4*p	2113	Cont.Struct.		22,000 cfs Inlet cap	100 LF	See footnote 3
A2-2	2-3	3	N4*p	2107	Channel		30'w x 6'd, cl	20,000 LF	Concrete line Existing Channel
A2-2	2-3	8	N4*p	....		Det. Basin	2000 acre-ft[4]	55 AC	See footnote 5
A2-2	2-3	9	N10*p	2300		Dike	42'w x 5'h, ul	15,000 LF	
A2-2	2-3	10	N10*p	2301		Dike	42'w x 5'h, ul	14,000 LF	
A2-2	2-3	11	N10*p	2302		Det. Basin	1,550 acre-ft	105 AC	See footnote 6
A2-2	2-3	13	N10*p	2304		Box Culvert	8'w x 6'd, rc	100 LF	
A2-4	2-5	45	C1*p	1030	Det. Basin	Outlet Works	Outflow structure[7]	...	Angel Park Det. Basin
A2-4	2-5	46	C2*p	1144		Bridge	28'w x 4'd, supported	100 LF	
A2-4	2-5	47	C2*p	1100		Channel	20'w x 4'd, cl	7,300 LF	

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[1] 42'w x 5'h, cl, 7,000 LF

[2] Depth varies

[3] Inlet Control Facility, NLV Detention Basin

[4] Total 5,400 cfs outlet capacity

[5] Addition to existing North Las Vegas Detention Basin; total volume = 3650 acre-ft

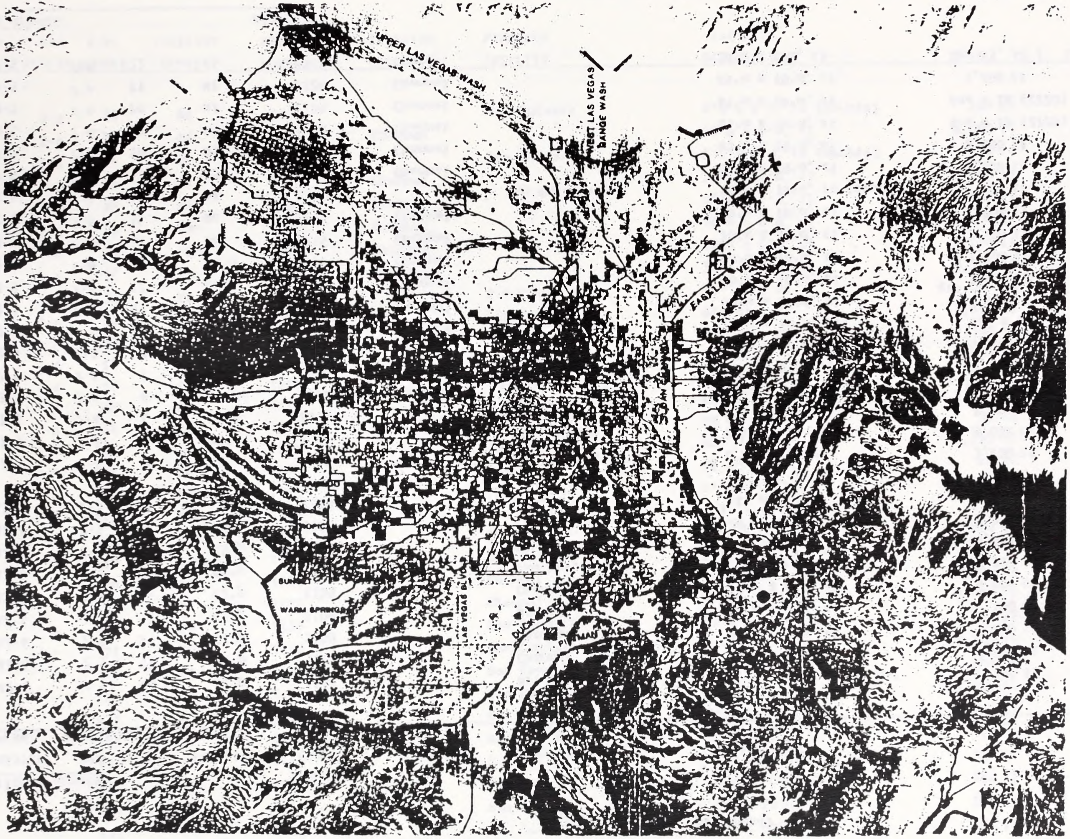
[6] Range Wash Western Tributary Detention Basin

[7] 490 cfs outlet capacity at a 1400 acre-ft detention basin

KEY

AC	acre	h	high	*c	construction
cfs	cubic ft. per second	l	lined	*d	design
cl	concrete lined	lf	linear ft.	*dc	design construction
cs	clear span	rc	reinforced concrete	*p	predesign
d	deep	ul	unlined		
dia	diameter	w	wide		
ft	feet				

10-YEAR CONSTRUCTION PROGRAM – STATUS OF PROJECTS END OF FY 98/99



5/89

CLARK COUNTY
REGIONAL
FLOOD CONTROL
DISTRICT
FLOOD CONTROL
MASTER PLAN

LEGEND

CONSTRUCTED
ENGINEERING
CHANNEL
PIPELINE/BOX CONDUIT
DIKE/LEVEE
DETENTION/RETENTION BASIN
● DEBRIS BASIN
FLOODWAY
BRIDGE/CULVERT
FACILITIES IN GREEN DESIGNATE PHASE 1 FACILITIES
FACILITIES IN BLACK DESIGNATE PHASE 2 FACILITIES

RECOMMENDED
FLOOD CONTROL
ALTERNATIVE
PHASE 1 AND 2
FACILITIES
LAS VEGAS VALLEY
FIGURE 7-3

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC

APPENDIX A (continued)

FIGURE NUMBER MASTER PLAN	BIO ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-4	2-5	48	C2*p	1142		Bridge	40'w x 4'd, supported	100 LF	
A2-4	2-5	49	C2*p	1100		Channel	20'w x 5'd, cl	2,000 LF	
A2-4	2-5	51	C2*p	1100		Channel	10'w x 6'd, cl	3,900 LF	
A2-4	2-5	52	C2*p	1100		Bridge	44'w x 6'd, cl	100 LF	
A2-4	2-5	53	C2*p	1100		Channel	20'w x 6'd, cl	5,000 LF	
A2-4	2-5	55	C3*p	1160		Two Det. Basins	1,660 acre-ft	220 AC	Gowan Det. Basin
A2-4	2-5	56	C3*p	1160		Pipeline	84" dia, rc	10,000 LF	
A2-4	2-5	57	C3	1160		Pipeline	90" dia, rc	3,200 LF	
A2-4	2-5	68	C4	1230		Pipeline	54" dia, rc	3,000 LF	
A2-5	2-6	2	N1*p	2009		Box Conduit	8'w x 6'd, rc	3,200 LF	
A2-5	2-6	3	N1*p	2010		Box Conduit	8'w x 8'd, rc	8,800 LF	
A2-5	2-6	4	N1*p	2011		Channel	5'w x 6'd, cl	7,200 LF	
A2-5	2-6	6	N1*dc	2012/2013	Channel		10'w x 8'd, cl	10,400 LF	See footnote 8
A2-5	2-6	7	N1*dc	2014	Channel		88'w x 9'd, cl	2,000 LF	Concrete Line Existing Channel
A2-5	2-6	8	N6*p	2201	Channel		20'w x 10'd, cl	5,000 LF	Concrete Line Existing Channel
A2-5	2-6	10	N6*p	2201	Channel		20'w x 10'd, cl	See # 8	Concrete Line Existing Channel
A2-5	2-6	11	N6*p	2203	Channel		80'w x 10'd, cl	2,400 LF	Concrete Line Existing Channel
A2-5	2-6	12	N6*p	2209	Channel		80'w x 10'd, cl	2,500 LF	Concrete Line Existing Channel
A2-5	2-6	13	N6*p	2211	Channel		80'w x 10'd, cl	3,200 LF	Concrete Line Existing Channel
A2-5	2-6	14	N6	2213	Channel		30'w x 10'd, cl	3,200 LF	Concrete Line Existing Channel
A2-5	2-6	15	N6	2215	Channel		30'w x 10'd, cl	4,800 LF	Concrete Line Existing Channel
A2-5	2-6	16	N6	2216		Box Culvert	10'w x 10'd, rc (four)	480 LF	
A2-5	2-6	17	N7	2208	Channel		80'w x 10'd, cl	2,400 LF	Concrete Line Existing Channel
A2-5	2-6	18	N7	2220	Channel		85'w x 10'd, cl	8,800 LF	Concrete Line Existing Channel
A2-5	2-6	19	N7	2220	Channel		85'w x 10'd, cl	See # 18 (2220)	Concrete Line Existing Channel
A2-5	2-6	20	N7	2220	Channel		85'w x 10'd, cl	See # 18 (2220)	Concrete Line Existing Channel
A2-5	2-6	21	N7	2224	Channel		85'w x 10'd, cl	1,200 LF	Concrete Line Existing Channel
A2-5	2-6	22	N4	2107	Channel		30'w x 6'd, cl	See #3, A2-2	Concrete Line Existing Channel

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[8] Channel partially excavated on south half, concrete line complete section

APPENDIX A (continued)

FIGURE NUMBER MASTER PLAN	FIGURE NUMBER MID ACCESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-5	2-6	23	N4	2108		Box Culvert	8'w x 6'd, rc (double)	200 LF	
A2-5	2-6	24	N4	2109	Channel		30'w x 8'd, cl	6,000 LF	Concrete Line Existing Channel
A2-5	2-6	25	N4	2110		Box Culvert	8'w x 6'd, rc (double)	100 LF	At Union Pacific Railroad
A2-5	2-6	26	N4	2109	Channel		30'w x 8'd, cl	6,000 LF	Concrete Line Existing Channel
A2-5	2-6	27	N6	2204	Channel		80'w x 8'd, cl	4,000 LF	King Charles Diversion Channel
A2-5	2-6	28	"N"	2205	Channel		10'w x 8'd, cl	3,600 LF	Concrete Line Existing Channel
A2-5	2-6	30	"N"	2207	Channel		30'w x 8'd, cl	2,200 LF	Concrete Line Existing Channel
A2-5	2-6	31	"N"	2207	Channel		30'w x 8'd, cl	1,500 LF	Concrete Line Existing Channel
A2-5	2-6	54	C4	1230		Pipeline	54" dia, rc	See #68 A2-4	
A2-5	2-6	55	C4	1230		Pipeline	66" dia, rc	3,800 LF	
A2-5	2-6	56	C4	1230		Pipeline	66" dia, rc	2,100 LF	
A2-5	2-6	57	C4	1230		Pipeline	78" dia, rc	1,900 LF	
A2-5	2-6	59	C4	1240		Pipeline	60" dia, rc	2,600 LF	
A2-5	2-6	60	C4	1240		Pipeline	66" dia, rc	2,700 LF	
A2-5	2-6	61	C4	1240		Det. Basin	50 acre-ft	15 AC	Detention Basin IV-28
A2-5	2-6	62	C4	1240		Pipeline	54" dia, rc	2,700 LF	
A2-5	2-6	103	C6*c	1374		Det. Basin	40 acre-ft	28 AC	Detention Basin U-28
A2-5	2-6	115	C7*p	1390		Box Conduit	2-10'w x 7'd, rc	500 LF	
A2-5	2-6	117	C7*p	1390		Box Conduit	2-10'w x 8'd, rc	850 LF	
A2-5	2-6	118	C7*p	1390		Channel	50'w x 6'd, cl	2,000 LF	
A2-5	2-6	119	C7*p	1390		Box Culvert	2-14'w x 8'd, rc	100 LF	
A2-5	2-6	120	C7*p	1390		Channel	50'w x 6'd, cl	1,900 LF	
A2-5	2-6	121	C7*p	1390		Channel	50'w x 7'd, cl	2,400 LF	
A2-5	2-6	123	C9	1430		Box Conduit	15'w x 10'd, rc	600 LF	
A2-5	2-6	124	C9	1430		Box Conduit	12'w x 10'd, rc	1,250 LF	
A2-5	2-6	125	C9	1430		Box Conduit	12'w x 10'd, rc	600 LF	
A2-5		126	C9	1430		Box Conduit	12'w x 8'd, rc	1,200 LF	
A2-5		127	C9	1430		Box Conduit	8'w x 6'd, rc	4,900 LF	
A2-5		129	C9	1430		Det. Basin	30 acre-ft	23 AC	Fantasy Park Det. Basin
A2-5		131	C9	1449		Box Culvert	14'w x 10'd, rc	100 LF	
A2-5		132	C9	1449		Box Culvert	14'w x 10'd, rc	100 LF	
A2-5		133	C9	1449		Box Culvert	14'w x 10'd, rc	100 LF	
A2-5		134	C9	1449		Box Culvert	14'w x 10'd, rc	100 LF	

APPENDIX A (continued)

FIGURE NUMBER MASTER PLAN	BIO ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-5	2-6	135	C9	1430		Box Conduit	14'w x 10'd, rc	8,000 LF	
A2-5	2-6	136	C9	1449		Box Culvert	15'w x 10'd, rc	100 LF	
A2-5	2-6	138	C9	1449		Box Culvert	15'w x 10'd, rc	100 LF	
A2-5	2-6	139	C9	1430		Box Conduit	15'w x 10'd, rc	7,100 LF	
A2-5	2-6	140	C9	1449		Box Culvert	15'w x 10'd, rc	100 LF	
A2-6	2-7	9	M12*p	2520		Det. Basin	1,400 acre-ft	155 AC	East Range Wash
A2-6	2-7	9ALT	M12*p	....		Det. Basin	....	80 AC	
A2-6	2-7	10	M12*p	2520		Dike	42 'w x 5'h, ul	2,600 LF	
A2-6	2-7	11	M12*p	2520		Channel	20'w x 8'd, cl	800 LF	
A2-7	2-8	13	C5*p	1342		Det. Basin	40 acre-ft	25 AC	Det. Basin CE-18
A2-7	2-8	48	S6	3004		Box Conduit	10'w x 6'd, rc	5,000 LF	
A2-7	2-8	59	S1*d	3009		Det. Basin	610 acre-ft	70 AC	Upper Flamingo Det. Basin (FW
A2-7	2-8	60	S10	3012		Channel	13'w x 10'd, l	4,200 LF	
A2-7	2-8	61	S2*d	3010		Channel	30'w x 7'd, l	3,400 LF	See footnote 9
A2-7	2-8	85	S26	3031		Dike	72" w x 10'h, l/ul	2,000 LF	See footnote 10
A2-8	2-9	1	M7	2226	Channel		80'w x 8'd, cl	5,000 LF	Concrete Line Existing Channel
A2-8	2-9	2	M7	2228	Channel		80'w x 8'd, cl	2,000 LF	Concrete Line Existing Channel
A2-8	2-9	3	M7	2230	Channel		80'w x 8'd, cl	2,000 LF	Concrete Line Existing Channel
A2-8	2-9	20	C7	1390		Channel	10'w x 6'd, ul	1,200 LF	
A2-8	2-9	21	C7	1390		Channel	10'w x 7'd, ul	2,400 LF	
A2-8	2-9	22	C7	1390		Box Conduit	8'w x 7'd, rc	3,400 LF	
A2-8	2-9	23	C7	1390		Box Conduit	9'w x 8'd, rc	3,000 LF	
A2-8	2-9	24	C7	1390		Box Conduit	2-10'w x 7'd, rc	3,000 LF	
A2-8	2-9	33	S9	3017		Channel	20'w x 7'd, l	8,500 LF	
A2-8	2-9	36	S3	3018		Box Conduit	15'w x 5'd, rc	1,500 LF	
A2-8	2-9	52	S27	3057		Bridge	67'w x 8'd, ce	100 LF	Replace Existing Structure

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[9] Channel oversized to handle spillway overflows

[10] Diversion to Tropicana Detention Basin

APPENDIX A (continued)

FIGURE NUMBER BASIN PLAN	FIGURE NUMBER HID ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-8	2-9	66	S26	3031		Dike	72'w x10'h, l	2,000 LF	
A2-8	2-9	67	S26	3031		Det. Basin	220 acre-ft	10 AC	Tropicana Det. Basin
A2-8	2-9	79	S25*p	3617		Pipeline	48" dia, rc	2,700 LF	
A2-8	2-9	80	S25*p	3618		Pipeline	60" dia, rc	3,400 LF	
A2-8	2-9	81	S25*p	3619		Channel	4'w x 3'd, cl	1,400 LF	
A2-8	2-9	82	S25*p	3620		Box Culvert	9'w x 5'd, rc	200 LF	
A2-8	2-9	83	S25*p	....	Channel		4'w x 3'd, cl	1,500 LF	No freeboard
A2-8	2-9	84	S25*p	3621		Box Culvert	9'w x 5'd, rc	100 LF	
A2-8	2-9	85	S25*p	....	Channel		4'w x 3'd, cl	1,000 LF	No freeboard
A2-8	2-9	86	S25*p	3622		Box Culvert	9'w x 5'd, rc	100 LF	
A2-8	2-9	87	S25*p	....	Channel		8'w x 4'd, cl	1,000 LF	
A2-8	2-9	88	S25*p	3623		Box Culvert	10'w x 5'd, rc	60 LF	
A2-8	2-9	89	S25*p	3624		Channel	6'w x 4.5'd, cl	1,700 LF	
A2-8	2-9	90	S25*p	3625	Box Culvert	Pipeline	36" dia, rc	1,100 LF	Add to 10'w x 4'd, rc Box Cul
A2-8	2-9	91	S25*p	....		Pipeline	3-42" dia, rc	1,200 LF	
A2-8	2-9	92	S25*p	3626		Box Culvert	12'w x 5'd, rc	3,600 LF	
A2-8	2-9	93	S24*p	3600		Box Culvert	12'w x 5'd, rc	60 LF	
A2-8	2-9	94	S24*p	3601		Channel	6'w x 5'd, cl	1,000 LF	
A2-8	2-9	95	S24*p	3602		Box Culvert	12'w x 5'd, rc	60 LF	
A2-8	2-9	96	S24*p	3603		Channel	6'w x 5'd, cl	1,000 LF	
A2-8	2-9	97	S24*p	3604		Box Culvert	12'w x 5'd, rc	100 LF	
A2-8	2-9	98	S24*p	3605		Channel	6'w x 5'd, cl	1,000 LF	
A2-8	2-9	99	S24*p	3606		Box Conduit	8'w x 5'd, rc	1,000 LF	
A2-8	2-9	100	S24*p	....	Channel		10'w x 5'd, cl	1,500 LF	
A2-8	2-9	101	S24*p	3607	Pipeline	Pipeline	42" dia, rc	80 LF	See footnote 11
A2-8	2-9	102	S24*p	....	Channel		10'w x 5'd, cl	1,100 LF	
A2-8	2-9	103	S24*p	3608	Pipeline	Pipeline	54" dia, rc	60 LF	See footnote 12
A2-8	2-9	104	S24*p	3609		Channel	10'w x 5'd, cl	1,100 LF	

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[11] Add 42" reinforced concrete pipe to existing 3-54" dia, rc pipeline

[12] Add 54" reinforced concrete pipe to existing 3-51" dia, rc pipeline

APPENDIX A (continued)

FIGURE NUMBER				STRUCTURE					
MASTER PLAN	HIO ASSESS	I.D. NUMBER	FACILITY NUMBER	GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-8	2-9	105	S24*p	3610	Pipeline	Pipeline	54" dia, rc	300 LF	See footnote 13
A2-8	2-9	106	S24*p	3609		Channel	10'w x 5'd, cl	See 104, A2-8	
A2-8	2-9	107	S24*p	3611	Pipeline	Pipeline	42" dia, rc	100 LF	See footnote 14
A2-8	2-9	108	S24*p	----	Channel		6'w x 5'd, cl	2,000 LF	
A2-8	2-9	109	S24*p	3612		Box Culvert	2-10'w x 4.5'd[15]	80 LF	
A2-8	2-9	110	S24*p	----	Channel		6'w x 5'd, cl	600 LF	
A2-8	2-9	111	S24*p	----	Pipeline		3-57" dia, rc	700 LF	
A2-8	2-9	112	S24*p	3613		Channel	6'w x 5'd, cl	2,500 LF	
A2-8	2-9	113	S24*p	3614		Box Culvert	2-8'w x 5'd, rc	60 LF	
A2-8	2-9	114	S24*p	----	Channel		10'w x 6.5'd, cl	1,100 LF	
A2-8	2-9	115	S24*p	3615		Box Culvert	2-8'w x 5'd, rc	80 LF	
A2-8	2-9	116	S24*p	----	Channel		10'w x 6.5'd, cl	1,000 LF	
A2-8	2-9	117	S24*p	3616		Channel	6'w x 5'd, cl	700 LF	
A2-8	2-9	125	S23	3534		Bridge	52'w x 8'd, cs	100 LF	
A2-8	2-9	127	S23	3535		Bridge	52'w x 8'd, cs	100 LF	
A2-8	2-9	168	S12	3052		Bridge	48'w x 7'd, cs	100 LF	Replace existing structure
A2-8	2-9	108	S15	3062		Bridge	34'w x 6'd, supported	100 LF	
A2-9	2-10	2	M7	2230	Channel		80'w x 8'd, cl	See #2, A2-8	Concrete Line Exist Channel
A2-9	2-10	3	M7	2232	Channel		50'w x 8'd, cl	4,800 LF	Concrete Line Exist Channel
A2-9	2-10	4	M7	2234		Box Bridge	10'w x 6'd, rc (seven)	100 LF	
A2-9	2-10	12	M3*p	2613		Box Culvert	10'w x 8'd, rc (four)	400 LF	Two Bridges at Boulder Hwy
A2-9	2-10	13	M3*p	2616		Channel	40'w x 8'd, cl	7,400 LF	
A2-9	2-10	14	M3*p	2617		Box Culvert	10'w x 8'd, rc	100 LF	
A2-9	2-10	15	M3*p	2616	Channel		40'w x 8'd, cl	See #13, A2-9	
A2-9	2-10	16	M3*d	2610	Channel		40'w x 8'd, cl	9,800 LF	
A2-9	2-10	17	M3*d	2612		Bridge	10'w x 8'd, rc (four)	400 LF	
A2-9	2-10	18	M3*p	2610	Channel		40'w x 8'd, cl	See #16, A2-8	

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[13] Add 54" reinforced concrete pipe to existing 3-51" dia, rc pipeline

[14] Add 42" reinforced concrete pipe to existing 5-48" dia, rc pipeline

[15] Double wide, reinforced concrete

APPENDIX A (continued)

FIGURE NUMBER MASTER PLAN	 BIO ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE: GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-9	2-10	31	M3*p	2608		Bridge	72'w x 8'd, cs	400 LF	
A2-10	2-11	2	S11	3560		Dike	72'w x 10'h, l	2,000 LF	
A2-10	2-11	3	S11	3560		Det. Basin	1,760 acre-ft	130 AC	Upper Blue Diamond Det. Basin
A2-10	2-11	23	S4	3500		Dike	72'w x 10'h[16]	9,000 LF	
A2-10	2-11	24	S4	3501/3502		Det. Basin	1,500 acre-ft	125 AC	Duck Det. Basin #1
A2-10	2-11	25	S22	3503		Floodway	500'w x 3'd	17,500 LF	
A2-10	2-11	28	S21	3505		Dike	72'w x 10'h[17]	3,500 LF	
A2-10	2-11	29	S21	3505		Det. Basin	520 acre-ft	75 AC	Duck Det. Basin #5
A2-11	2-12	4	S17	3512		Det. Basin	1,040 acre-ft	65 AC	Lower Blue Diamond Det. Basin
A2-11	2-12	14	S18	3515		Det. Basin	90 acre-ft	30 AC	NDOT Det. Basin
A2-11	2-12	17	S20	3518		Dike	60'w x 8'h, ul	6,000 LF	
A2-11	2-12	18	S20	3519		Det. Basin	170 acre-ft	20 AC	Duck Det. Basin #4
A2-11	2-12	24	S19	3523		Det. Basin	645 acre-ft	35 AC	Duck Det. Basin #3
A2-11	2-12	37	S29	3200		Dike	72'w x 10'h, l	2,000 LF	
A2-11	2-12	38	S29	3200		Det. Basin	1,140 acre-ft	55 AC	See footnote 18
A2-11	2-12	39	S29	3200		Channel	30'w x 8'd, l	4,200 LF	
A2-11	2-12	45	S30	3204		Channel	8'w x 6'd, l	9,200 LF	
A2-11	2-12	56	M3*d	2606		Channel	25'w x 8'd, cl	9,000 LF	
A2-11	2-12	57	2618	2618		Channel	5'w x 6'd, cl	11,000 LF	
A2-11	2-12	--	GVBR	----		Bridge	----	100 LF	Green Valley Bridge
A2-11	2-12	--	GVBX	----		Box Culvert	----	100 LF	Green Valley Box
A2-12	2-13	10	M1	2708		Channel	10'w x 6'd, cl	4,000 LF	
A2-12	2-13	11	M1	2704		Channel	5'w x 6'd, cl	3,200 LF	
A2-12	2-13	12	M1	2706/2707		Box Culvert	8'w x 4'd rc	100 LF	
A2-12	2-13	13	M1	2704		Channel	5'w x 6'd, cl	See A2-12, #11	
A2-12	2-13	14	M1	2703		Det. Basin	650 acre-ft	75 AC	Boulder Hwy Det. Basin

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[16] Lined one side

[17] Lined one side

[18] Pittman Detention Basin 2,000 cfs to Bypass Channel

APPENDIX A (concluded)

FIGURE NUMBER MASTER PLAN	BIO ASSESS	I.D. NUMBER	FACILITY NUMBER	STRUCTURE GROUP NUMBER	EXISTING FACILITY	PROPOSED FACILITY	FACILITY DESCRIPTION	SIZE	COMMENTS/FOOTNOTES
A2-14	2-15	4	B1	4100		Dike	70'w x 10'h, ul	700 LF	
A2-14	2-15	5	B1	4100		Dike	70'w x 10'h, l	650 LF	
A2-14	2-15	21	B5'd	4107	Channel		8'w x 3.5'd, l	8,000 LF	Concrete Line Existing Channel
A2-14	2-15	22	B5'd	4107	Channel		8'w x 4'd, l	See A2-14, #21	Concrete Line Existing Channel
A2-14	2-15	23	4108	4108		Channel	8'w x 4'd, l	2,500 LF	
A2-14	2-15	24	4108	4108		Channel	25'w x 3'd, l	9,000 LF	
A2-14	2-15	26	4108	4108		Floodway	50'w w/3' dikes	5,000 LF	
A2-14	2-15	28	4109	4109		Floodway	50'w w/3' dikes	15,500 LF	
A2-14	2-15	30	4110	4110		Floodway	100'w w/10' dikes	4,000 LF	
A2-14	2-15	31	4114'd	4114		Debris Basin	5 acre-ft[19]	10 AC	
A2-14	2-15	35	B2'd	4111		Box Culvert	6-36" dia, rc	200 LF	Add 2 Culverts
A2-14	2-15	36	B4'd	4113		Channel	25'w x 5'd, l	2,000 LF	
A2-14	2-15	39	B3	4112		Channel	10'w x 5'd, l	2,800 LF	
A2-14	2-15	40	4110	4110		Culvert	4-54" dia, rc	100 LF	
A2-14	2-15	41	B4'd	4113		Channel	50'w x 5'd, l	3,000 LF	
A2-14	2-15	43	4110	4110		Culvert	4-60" dia, rc	100 LF	Add 1 Culvert
A2-14	2-15	44	B4'd	4113		Channel	80'w x 5'd, l	4,000 LF	
A2-14	2-15	45	4108	4108		Bridge	50'w, supported	100 LF	

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[19] 800 cfs outlet capacity (illustrated in MP as 5 AC)

APPENDIX B

Table B-1. 10-year plan facilities not likely to adversely affect the desert tortoise

Facility-I.D. #	Map #	Proposed Facility
North Las Vegas Valley		
N4-25	A2-5	Box culvert, Las Vegas Wash below Las Vegas Wash Detention Basin
N4-26	A2-5	Concrete line existing channel, Lower Las Vegas Wash
N6-8,10 11,12,13, 14,15	A2-5	Concrete line existing channels, Lower Las Vegas Wash
N6-16	A2-5	Box culvert, Lower Las Vegas Wash
N6-27	A2-5	King Charles Diversion Channel, Lower Las Vega Wash
N7-1,2,3	A2-8	Concrete line existing channels
N7-17,18 19,20,21	A2-5	Concrete line existing channels
Central Las Vegas Valley		
C3-56,57	A2-4	Pipelines, Gowan Detention Basin Outfall
C4-54,55 56,57,59, 60.62	A2-5	Pipelines, Carey Ave./Lake Mead System
C4-61	A2-5	Detention Basin LV-2B, Carey Ave./ Lake Mead System
C4-68	A2-4	Pipeline, Carey Ave./Lake Mead System
C5-13	A2-7	Oakley Avenue Detention Basin
C6-103	A2-5	Detention Basin W-2B, Meadows Dam and Collection System
C7-20,21	A2-8	Channels (unlined), Conveyance West Side I-15
C7-22,23 24	A2-8	Box conduits, Conveyance West Side I-15
C7-115,117	A2-5	Box Conduits, I-15 Conveyance System

Table B-1. 10-Year Plan Facilities not likely to adversely affect the desert tortoise (Continued)

Facility-I.D. #	Map #	Proposed Facility
C7-118, 120,121	A2-5	Channel, I-15 Conveyance System
C7-119	A2-5	Box culvert, I-15 Conveyance System
C9-123, 124,125, 126,127, 135,139	A2-5	Box Conduits, Washington Ave.
C9-129	A2-5	Fantasy Park Detention Basin
C9-131, 132,133, 134,136, 138,140	A2-5	Box culverts, Washington Ave.
Southwest Las Vegas Valley		
S3-36	A2-8	Box conduit, Winick Ave.
S9-33	A2-8	Channel, Flamingo Wash
S10-60	A2-7	Buffalo Road Channel
S12-168	A2-8	Valley View ridge on Flamingo Wash
S15-188	A2-8	Industrial Road Bridge on Tropicana Wash
S23-125	A2-8	Pachuca and Tomiyasu bridges on Duck Creek
S24-93,95 97,109, 113,115	A2-8	Box culverts, Rawhide Channel
S24-94,96, 98,100,102, 104,106,108 110,112,114, 116,117,	A2-8	Channels, Rawhide Channel
S24-99	A2-8	Box conduit, Rawhide Channel
S24-101, 103,105, 107,111	A2-8	Pipelines, Rawhide Channel

Table B-1. 10-Year Plan facilities not likely to adversely affect the desert tortoise (continued)

Facility-	Map #	Proposed Facility
S25-79,80, 90,91	A2-8	Pipelines, Van Buskirk Channel
S25-81,83	A2-8	Channels, Van Buskirk Channel
S25-82,84, 86,88,92	A2-8	Box culverts, Van Buskirk Channel
S26-66	A2-8	Dike, Tropicana Detention Basin
S26-67	A2-8	Tropicana Detention Basin
S26-85	A2-7	Dike, Tropicana Detention Basin
S27-52	A2-8	Boulder Highway Bridge on Flamingo Wash
Boulder City None		
Henderson H3-13,15	A2-9	Pittman Wash Channel
H7-2,3	A2-9	Channels
H7-4	A2-9	Box Bridge

Table B-2. 10-year plan facilities likely to adversely affect the desert tortoise

Facil. #	Map #	Proposed Facility
North Las Vegas Valley		
N1-2,3	A2-5	Box conduits, Gowan Rd. Outfall Structure
N1-4	A2-5	Channel, Gowan Rd. Outfall Structure
N1-6,7	A2-5	Concrete line existing channels, Gowan Rd. Detention Basin Outfall
N3-1	A2-2	Floodway, Las Vegas Wash
N3-8	A2-1	Upper Las Vegas Wash Detention Basin
N4-2	A2-2	Inlet control facility, North Las Vegas Detention Basin
N4-3	A2-2	Concrete line existing channel, Las Vegas Wash below detention basin
N4-8	A2-2	Addition to North Las Vegas Detention Basin
N4-22	A2-5	Concrete line existing channel, N. Las Vegas Detention Basin Outfall
N4-23	A2-5	Box culvert, N. Las Vegas Detention Basin Outfall
N4-24	A2-5	Concrete line existing channel, N. Las Vegas Detention Basin Outfall
N5-1,2	A2-1	Kyle Basin dikes
N5-3	A2-1	Kyle Canyon Detention Basin
N5-4	A2-1	Kyle Canyon Detention Basin Overflow Structure (concrete lined)
N5-5,6,7	A2-1	Channels and box culvert, Kyle Canyon System
N10-9,10	A2-2	West Range Wash dikes (unlined)
N10-11	A2-2	Range Wash Western Tributary Detention Basin
N10-13	A2-2	Box culvert, West Range Wash System
N12-9	A2-6	East Range Wash Detention Basin
N12-9 alt	A2-6	East Range Wash Detention Basin

Table B-2. 10-Year Plan facilities likely to adversely affect the desert tortoise (Continued)

Facil. #	Map #	Proposed Facility
N12-10	A2-6	Dike (unlined), East Range Wash System
N12-11	A2-6	Channel (concrete lined), East Range Wash System
Central Las Vegas Valley		
C1-45	A2-4	Angel Park Detention Basin Outflow Structure
C2-46,48, 52	A2-4	Bridges, Angel Park/Gowan Detention Basin Conveyance System
C2-47,49, 51,53	A2-4	Angel Park/Gowan Collection Channels
C3-55	A2-4	Gowan Detention Basin
Southwest Las Vegas Valley		
S1-59	A2-7	Upper Flamingo Detention Basin
S2-61	A2-7	Upper Flamingo Wash Outfall Channel
S4-23	A2-10	Dike near Duck Detention Basin #1 on West Branch of Duck Creek
S4-24	A2-10	Duck Detention Basin #1
S6-48	A2-7	Durango Drive reinforced concrete box conduit
S11-2	A2-10	Upper Blue Diamond Detention Basin Dike
S11-3	A2-10	Upper Blue Diamond Detention Basin
S17-4	A2-11	Lower Blue Diamond Detention Basin
S18-14	A2-11	Nevada Department of Transportation Detention Basin
S19-24	A2-11	Duck Detention Basin #3
S20-17	A2-11	Duck Detention Basin #4 Dike
S20-18	A2-11	Duck Detention Basin #4
S21-25	A2-10	Duck Detention Basin #5 Dike
S21-29	A2-10	Duck Detention Basin #5
S22-25	A2-10	Floodway on West Branch of Duck Creek

Table B-2. 10-Year Plan facilities likely to adversely affect the desert tortoise (Continued)

Facil. #	Map #	Proposed Facility
S29-37	A2-11	Duck Creek System Dike
S29-38	A2-11	Pittman Detention Basin
S29-39	A2-11	Pittman Detention Basin Channel
S30-45	A2-11	Channel
Boulder City		
B1-4,5	A2-14	Bootleg Canyon Diversion Dikes
B2-35	A2-14	Box culvert, Hemenway Wash Crossing
B3-39	A2-14	Ville Drive Channel
B4-36,41, 44	A2-14	Hemenway Wash channels
B5-21,22	A2-14	Buchanan Blvd. Channel
4108-23, 24	A2-14	Buchanan Wash channels
4108-26	A2-14	Buchanan Wash Floodway
4108-45	A2-14	Buchanan Wash Bridge
4109-28	A2-14	Cemetery Wash Floodway
4110-30	A2-14	Hemenway Wash Floodway
4110-43	A2-14	Hemenway Wash culvert
4114-31	A2-14	Debris Basin
Henderson		
H1-10,11, 13	A2-12	Boulder Highway Detention Basin channels
H1-12	A2-12	Boulder Highway Detention Basin box culvert
H1-14	A2-12	Boulder Highway Detention Basin
H3-12,18	A2-9	Pittman Wash Channels
H3-14	A2-9	Pittman Wash Channel box culvert
H3-17,31	A2-9	Pittman Wash Channel Bridges

Table B-2. 10-Year Plan facilities likely to adversely affect the desert tortoise (Continued)

Facil. #	Map #	Proposed Facility
H3-56	A2-11	Pittman Wash Channel
2618-57	A2-11	Channel
GVBR	A2-11	Green Valley Bridge
GVBX	A2-11	Green Valley box culvert

APPENDIX C

Desert Tortoise Handling and Overwintering Procedures

(Note: Much of the information contained herein was obtained from Chapter III, Protocols for Handling Live Tortoises, in the Interim Techniques Handbook for Collecting and Analyzing Data on Desert Tortoise Populations and Habitats. This handbook is a cooperative effort among federal and state agencies. Primary editor is Dr. Cecil Schwalbe of the University of Arizona, Tucsón, Arizona. The information on handling tortoise eggs was developed by the Reno Field Station in consultation with Dr. Schwalbe, Betty Burge of Las Vegas, Nevada, and the Service's Ventura Field Office.)

1. All desert tortoises shall be handled in a careful manner. This includes lifting the animal slowly, fully supporting the animal in an upright position, and completing various measurements in the minimum amount of time. A tortoise can be damaged or die of intestinal torsion. If a tortoise must be turned over on its back, this should be done gently. The fieldworker should turn the tortoise over by carefully rolling it over on its side to its back and return the tortoise to the upright position by rolling it back in the same direction. The tortoise should not be rolled end over end, side over side, or spun.

Tortoises, especially females, may be fatally damaged by blows, butting, or overturning, which results in egg yolk peritonitis brought on by seepage of egg yolk or breakage of shelled eggs into the peritoneal cavity. Handling of potentially gravid females should be done very carefully.

To prevent hyperthermia, on warm days a tortoise must be kept in the shade (of the fieldworker, a pack, other equipment, etc.) except during photography. Tortoises should not be weighed, measured, etc. when air temperatures exceed 90 F (32°C) at 1.5 m (4.9 ft) above ground. CAUTION! TEMPERATURES ARE MUCH HIGHER NEARER THE GROUND. Take extreme caution to avoid overheating a tortoise whenever surface temperatures exceed 86°F (30°C). Shield the bulb of the thermometer from direct solar radiation and wind when measuring temperatures.

2. Because of the threat of Upper Respiratory Disease Syndrome (URDS), all tortoises shall be handled so as to minimize the chances of spreading the disease, even if URDS has not been documented in a given locality. All personnel handling tortoises shall wear disposable latex or plastic gloves to prevent transmission of diseases among tortoises. Not more than one tortoise shall be handled with each pair of gloves.

All equipment that comes in contact with any tortoise shall be sterilized before it is used on another tortoise. For example, triangular files for notching, calipers for measuring shell length, rules, and other equipment should be sterilized by soaking in 95% isopropyl or ethyl alcohol for at least 20 minutes before using on another tortoise. A 25% solution of chlorine bleach may also be used but bleach is extremely corrosive and may damage many types of equipment. Wooden rules should not be used; they are difficult to sterilize because of the porosity of the wood. Use metal or plastic rules instead.

To avoid sterilizing spring scales or weighing straps prior to weighing each tortoise, use individual "T-shirt" bags, the plastic bags with two handles that are used to bag groceries. The handles of the bag can be used to suspend the tortoise during weighing.

The fieldworker's clothes should be changed completely, including shoes before visiting other tortoise sites. Always visit the site with known occurrence of URDS last to minimize the chance of spreading the disease. Vehicles, especially tires and undercarriage, should be washed between sites in areas where URDS is known or suspected to occur.

When transported by vehicle or confined, each tortoise should be contained in a newly-purchased, clean cardboard box of an appropriate size. Boxes should never come in contact with more than one tortoise. Tortoises should never be placed in automobile trunks or on floorboards in an unconfined manner. Tortoises should never be placed in the bed of a truck over the catalytic converter as this area of the metal bed may become extremely hot. Tortoises must not be left unattended in vehicles; this measure is intended to eliminate accidental mortality caused by overheating. Truck beds and floorboards must be padded and travel should be at speeds which eliminate unnecessary vibrations.

3. All tortoises moved as a result of mitigation measures for this project should be individually marked, per Bureau of Land Management standards (Enclosure 1). Notching and tagging are the current preferred methods for long-term marking and are supplemented with photographs and drawings. All four methods should be used to insure that over time the tortoise can be properly identified in future years.

Notching: "V" shaped notches are placed in the marginal scutes using a triangular file or, in the case of young tortoises, a nail clipper. We recommend that you do not notch the bridge marginal scutes, that is, those marginal scutes that connect the carapace to the plastron (M4 through M7) because of the difficulty in identifying the shallow notches in later years. Please refer to the enclosed figure that illustrates the coding system for notching tortoises used by the Bureau of Land Management. Care should be taken to avoid deep cuts that could cause bleeding. Generally, bleeding does not occur unless notches pass through the bony tissue. If notches are too deep and bone is damaged, regeneration of the tissue may occur and the area notches will be sloughed. For example, several tortoises notched in 1980 and recaptured in 1987 have barely recognizable notches. For information on how to properly notch a desert tortoise, please refer to Chapter III, Protocols for Handling Live Tortoises from the Interim Techniques HAndbook for Collecting and Analyzing Data on Desert Tortoise Populations and Habitats.

Tagging: Tagging was originally used in 1977 and appears to be as effective or better than notching for a long-term marking technique. Place a small dot of white paint on the fourth left costal scute; wait for the paint to dry. Write the identifying number for that tortoise on the dry dot using permanent black ink. Wait for the ink to dry and cover the dot and the ink with quick-drying clear epoxy. Note that the epoxy should not touch the suture lines between the scutes. We also recommend that the numbers not be placed in the middle of the scute as this area may be sloughed or rubbed depending on the age of the tortoise and habitat in which it occurs.

In addition a photograph (35mm slide) of the carapace, plastron, and fourth left costal scute should be taken. If possible dust off the tortoise with a small brush to remove mud or dust from the scutes. Remember the brush must be either sterilized or disposed of after each use. Place a small piece of white paper (16 mm x 90 mm) on the edge of the shell with information on the study site name, date, and tortoise number. The tortoise shell area and fourth costal scute should fill the slide frame. Drawings should be made showing any anomalies (e.g., extra or missing marginal, costal, or vertebral scutes) or injuries (e.g., punctures holes from canines, tooth scrapes).

The Bureau should develop its own cataloging format to enable it and others to track tortoises handled as a result of development projects.

4. A standard data sheet should be developed to record the following information:

A. Name of person collecting the animal.

B. Exact location and date of collection, using District maps for the project.

C. The individual number assigned to that animal.

D. The over-wintering location of the tortoise.

E. The release site and date of release of the animal.

F. Health condition of the tortoise, including measured weight and length at initial capture and release. In addition to this information complete the URDS checklist (enclosure).

G. Photographs of carapace, plastron, and fourth left costal scute.

H. The information specified in 4.A. through 4.G. must be supplied to the Bureau and the Fish and Wildlife Service (Service) immediately after cessation of both tortoise clearing and release activities. The information should be provided in the form of a report accompanied by data sheets.

5. Tortoises which are found actively moving on the surface should be placed under a shrub on the far side of the tortoise-proof fence from the flood control facility within 300 feet of the capture point. Should the capture occur late in the day so the animal will not have sufficient time to find a suitable burrow for the night, the tortoise should be placed in a clean cardboard box as described above and held in an appropriate place safe from predators and danger of hyperthermia, until release can occur in the morning.

6. All tortoises removed from burrows between November 1 and March 15 should be transported in cardboard boxes to the approved over-wintering site. Each tortoise should be placed in an artificial burrow within a fenced enclosure with one tortoise per enclosure. Each enclosure must be separate from adjacent pens so that one tortoise can not place its head or limbs through the fence and physically contact a tortoise in an adjacent enclosure. Fencing does not need to be buried but should be stable enough to preclude escape. The tortoise may be placed in a suitable natural or artificial burrow in adjacent tortoise habitat if available. The tortoises should be monitored at the new burrow until it appears to have resumed normal hibernating behavior. The Service can provide recommendations on measures to be implemented to retain a tortoise in its new hibernaculum.

The main chamber of the burrow should be constructed of plywood and the roof placed approximately 2.5 feet below the soil surface. The burrow's tunnel should be eight to 10 feet long with a gentle slope (e.g., about 4:1). The tunnel should be stabilized on the top with PVC pipe cut in half. The diameter of the pipe should be sufficient to permit the tortoise to easily turn around in the tunnel. After placement of the tortoise in the burrow, the entrance of the tunnel should be partially blocked with loose topsoil.

7. If any tortoise is excavated that is underweight, as determined by comparison to regressions developed by Dr. Michael Weinstein for the tortoises at the Honda project, the tortoise should be placed in a room at a temperature of 90 to 100 F and allowed to soak in fresh water for two to three hours. After rehydration and drying, the tortoise should be cooled to hibernation temperature slowly and placed in an artificial burrow. This procedure should be implemented only by persons authorized by this Opinion to handle tortoises and only by those instructed in this manner of treatment.

8. Beginning in February, activity of the tortoises within the artificial burrows should be monitored to determine an appropriate release time. Tortoises should be released in the morning hours when temperatures are conducive to activity. The appropriate time for release will probably occur in the third week of March.

9. Each tortoise should be released as close to the original capture point as possible but not more than 300 feet from the capture point. Releases should occur on the far side of any tortoise-proof fence from the flood control facility. Released tortoises should be placed under a shrub in the shade. Releases should occur at a temperature that is suitable for activity, with reasonable expectation that the temperature will remain within the tortoise's thermal preference long enough for the tortoise to adjust to its surroundings. Tortoises should be monitored at the release site until they are exhibiting normal behavior. To facilitate this measure, each tortoise must be accompanied by one of the approved biologists. There shall be no mass releases of animals.

10. Tortoise eggs shall be moved to artificial nests either in the wild or at an approved facility. Biologists must receive special training in the procedures outlined below, but such training can be obtained after a nest is actually found. If this is done, the nest should be carefully covered with soil so as not to move the eggs and protected until on-site training is provided. The Bureau through the District should ensure that this training is made available.

Any nest that is found shall be carefully excavated by hand at a time of day when the air temperature 6 inches above the ground is approximately equal to the soil temperature at egg level. Immediately upon finding a nest, large tool use should be discontinued and the nest excavated by the biologist using his or her hands. Before disturbance of nest contents, each egg shall be gently marked with a small dot on the top using a felt-tipped pen to establish the egg's orientation in the nest. In handling nest contents, eggs must be maintained in this orientation at all times. Because egg shells become extremely fragile in the last few weeks before hatching, special care should be taken with eggs found from August to mid-October. Because these eggs are very fragile, some may break during handling. This will be lethal to egg contents. Such an accident can be expected to occur until techniques are developed to avoid this type of incident. Broken eggs should be buried nearby and left in the field, or the contents preserved and provided to qualified researchers.

The biologist should measure and record the depth of the nest below the soil surface, the location of the nest in relation to any adjacent shrub (ie, whether on the north, south, east, or west side of the shrub), the species of shrub and its approximate foliage volume, and the soil type. Place approximately one inch of soil from the nest area in a bucket and carefully transfer the eggs to the bucket, maintaining egg orientation. Cover the eggs with soil that is free of cobbles and pebbles, to a depth equivalent to that in the original nest.

If good tortoise habitat is available in the general area, the eggs should be relocated at a distance of 600 to 900 feet from the flood control facility in an area away from roads. Prepare a nest with the same depth, orientation, location in relation to a specific shrub species, and in the same soil type as the original nest. Carefully transfer the eggs, maintaining their original orientation, to the new nest. The eggs should be replaced so that they touch one another. Gently cover with soil from which cobbles and pebbles have been removed so that all the air spaces around the eggs are filled.

If a suitable site for a new nest is not available in the wild, the eggs may be prepared for incubation in a suitable holding facility. Place a small amount of soil in a bucket and transfer the eggs to the bucket using the technique specified above, making sure the eggs are touching one another. Carefully fill the bucket to the depth of the original nest, but leave the top of the soil layer 3 inches below the rim of the bucket so that future hatchlings cannot escape. Bury the bucket in soil in a safe location at an approved holding facility.

The biologist shall record in detail all the procedures used in moving eggs. Personnel caring for incubating eggs at a facility shall maintain a record of where the eggs were found, method of incubation, length of time and conditions under which the eggs were incubated, observations of eggs during the incubation period, information about hatchling health and behavior, and disposition of the hatchlings.

11. Relocated nests in the wild shall be monitored by a qualified biologist. The monitoring program shall be developed in consultation with the Service.

12. Should any deviation from the procedures outlined above be necessary, the approved biologist should contact the Fish and Wildlife Service as soon as possible.

13. A final report, containing all the information noted above and including release information, must be supplied to the Service and the Bureau within one month of the final releases or disposition of tortoises.

BLM HEALTH PROFILE FORM FOR DESERT TORTOISES - SPRING 1990 Rev. 4-22-90
K.Berry

Fieldworker ____________
Site no. ____________
Township ______ Range ________
Section ______ Grid ________
County ____________
State ____________

Tort. no. ________
Captype ________
Sex ________
Weight (g) ________
feces/void ________
total (g) ________

Date (mo/d/yr) ____________
Time (PST) ____________
Weather conditions (recency of precipitation, pooled water) ____________
____

POTENTIAL NASAL DISCHARGE

BEAK/NOSE	Yes	No
Beak/nose wet	___	___
Beak/nose damp	___	___
Beak/nose dry	___	___
Nasal exudate present	___	___
Exudate clear	___	___
Exudate cloudy	___	___
Exudate white	___	___
Exudate yellow	___	___
Exudate green	___	___
Bubble(s) from nares	___	___
Nares:		
One occluded	___	___
Both occluded	___	___
Dirt on nose/beak	___	___
Dirt in nares	___	___
FORELEGS		
Dried dirt on forelegs	___	___
Moisture on forelegs	___	___
Dried exud. on scales[1]	___	___
Scales cracking[2]	___	___
BREATHING		
Smooth, clear	___	___
Wheezing	___	___
Rasping	___	___

EYES, CHIN GLANDS, INTEGUMENT

Circle eyes or lids:	Yes	No
Eye/lids whitened or discolored	___	___
Eyes/lids wet	___	___
Eyes/lids swollen	___	___
Eyes sunken	___	___
dull, cloudy	___	___
clear, bright	___	___
Chin glands draining	___	___
INTEGUMENT[3]		
Integument dull	___	___
Integument glossy	___	___
Normal elasticity	___	___
Skin peeling	___	___
ORAL CAVITY[4]		
Observed	___	___
Discharge present	___	___
Membranes pink	___	___
Membranes pale, white	___	___
Smells/mouth rot	___	___
POSTURE/BEHAVIOR		
Alert, responsive	___	___
Lethargic	___	___
Can pull limbs/head tightly into shell	___	___
Limbs, head hanging limp and loose	___	___

PARASITES

Describe ____________
____
____
____

URINE

Voided? ____________
____
Viscosity ____________
____
____
____
Particulates ____________
____
____

Footnote 4. Importan Absolutely do not try to open mouth. Make observations opportun istically, if tortois opens mouth.

---

[1] Dr. Jacobson described a situation similar to humans with draining noses: shiny integument, glossy with dried exudate.

[2] Taken a step from footnote 1, the integument can crack from effects of exudate, as in a human with chapped lips.

[3] This will be difficult, but do the best you can. For normal elasticity, gently pull skin o limbs, note how quickly skin returns to position. Show sites for peeling skin on page 2.

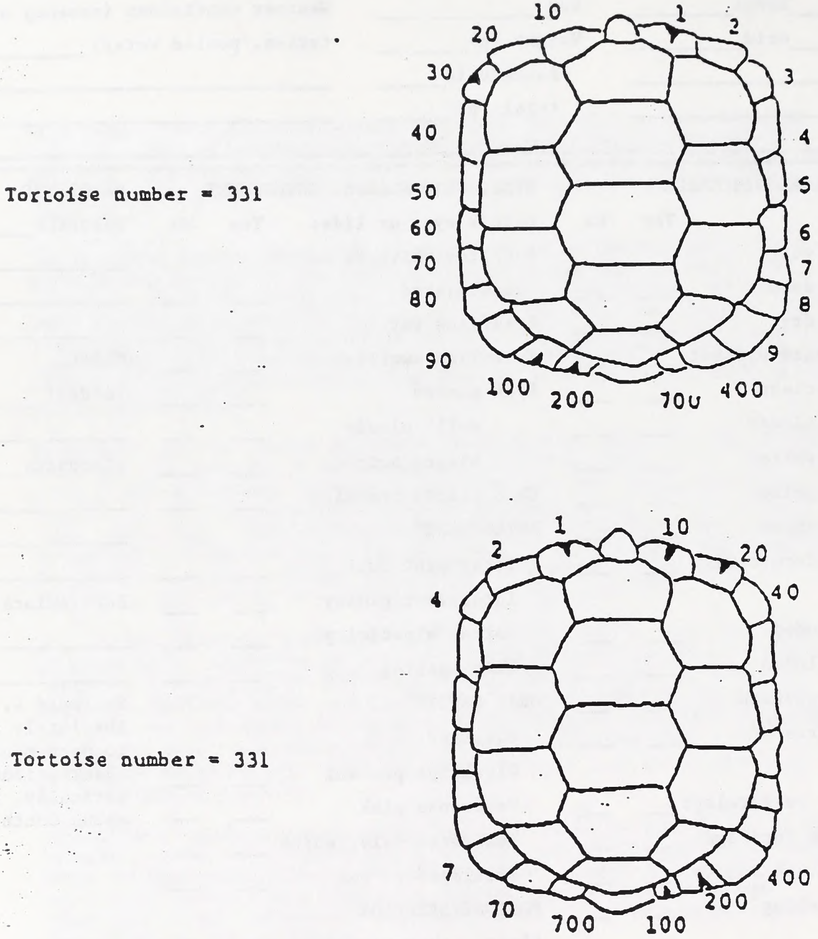


Figure III-2. Coding system (notching) for desert tortoises. Top: System used on most BLM plots in California, Nevada and Arizona. Some workers do not use the bridge scutes (marginals four through seven) when marking turtles or tortoises. Bottom: System used on BLM plots in Utah and on the Arizona Strip.

BLM HEALTH PROFILE FORM FOR DESERT TORTOISES - SPRING 1990

Rev. 4-22-90
K. Berry

Fieldworker ____________ **Tort. no.** ________ **Date (Mo/d/yr)** ____________

Site no. ____________

EVIDENCE OF SHELL DISEASE

	Yes	No
Lesions present	___	___
Lesions active	___	___
Lesions healed	___	___
Necrosis present	___	___
Pitting	___	___
Pitting diffuse	___	___
Pitting concen.	___	___
Fungal areas	___	___
Gular intact	___	___

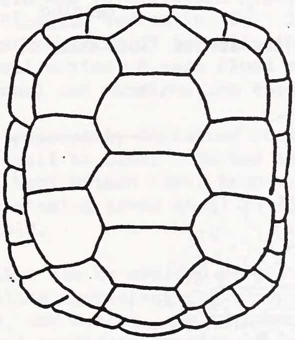
EVIDENCE OF TRAUMA TO:

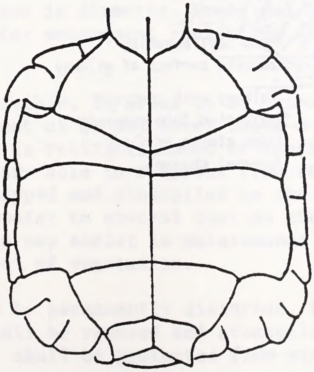
	Yes	No
Head	___	___
Forelimbs	___	___
Hindlimbs	___	___
Shell	___	___

Describe ______________________

____

____





TISSUE SAMPLES COLLECTED:

	Yes	No
Blood	___	___
Urine	___	___
Nasal smear	___	___
Nasal wash	___	___
Bone plug	___	___
Scute scrapings	___	___

Other (describe) ______________

____

____

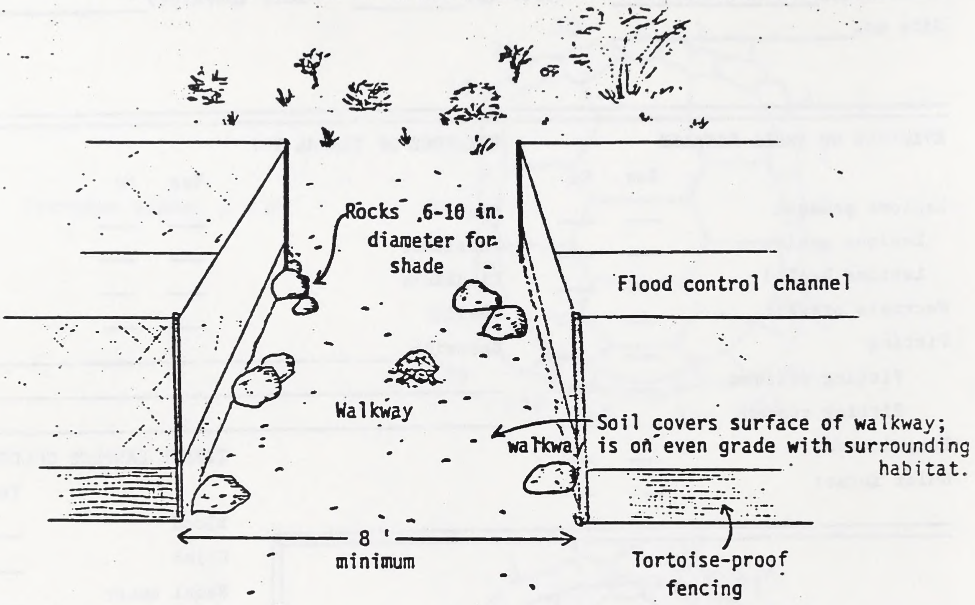
____

GENERAL LEGEND FOR DIAGRAM:

#	Shell necrosis
///	Trauma (lesions, injur
∞	Ticks, mites

In general, show all areas with lesions, necrosis, pitting, fungus, and injuri

APPENDIX D. DESIGN OF TORTOISE WALKWAY ACROSS FLOOD CONTROL CHANNEL


Rocks 6-10 in. diameter for shade
Flood control channel
Walkway
Soil covers surface of walkway; walkway is on even grade with surrounding habitat.
8' minimum
Tortoise-proof fencing

General design of walkway for tortoises across flood control channel

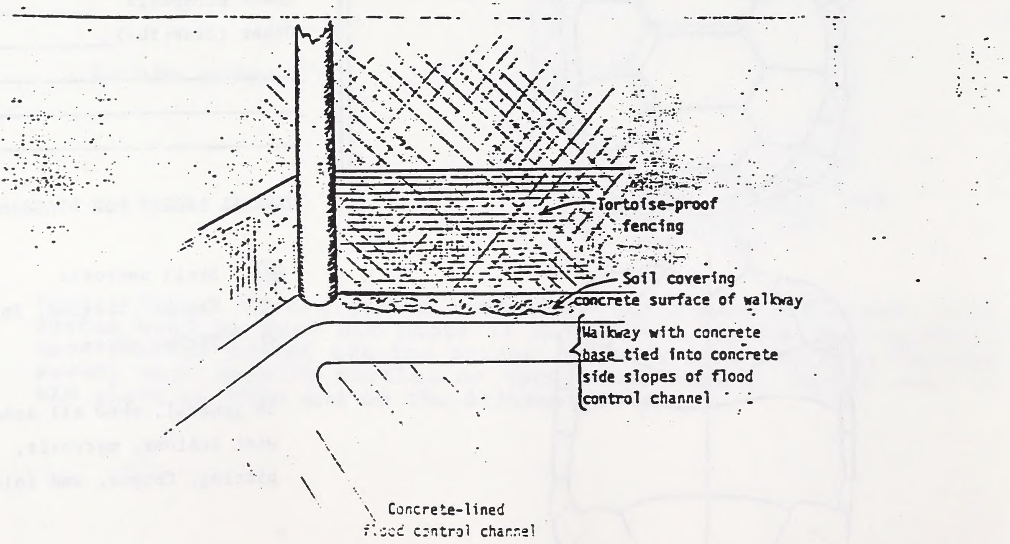

Tortoise-proof fencing
Soil covering concrete surface of walkway
Walkway with concrete base tied into concrete side slopes of flood control channel
Concrete-lined flood control channel

Diagram showing base of walkway from inside of flood control channel

APPENDIX E

REVEGETATION MEASURES FOR CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 10-YEAR PLAN FACILITIES IN DESERT TORTOISE HABITAT

The measures presented below have been developed by the Service for revegetation of temporarily disturbed areas in desert tortoise habitat. These techniques have been used successfully in other revegetation projects in the Mojave desert and are consistent with those proposed for other projects now under review by the Service. The goal of this program is to minimize disturbance of the soil surface, minimize damage to root crowns of shrubs, and encourage re-establishment of natural vegetation by conserving topsoil, conserving onsite seed sources, and implementing measures to encourage the germination of seed.

The District through the Bureau shall designate a person experienced with desert revegetation techniques to oversee the revegetation effort in tortoise habitat (revegetation specialist). This person shall be responsible for interpreting the revegetation plan to construction crews and ensuring compliance with the revegetation plan, monitoring shrub clearing and blading activities, flagging vegetation that is to remain undisturbed, overseeing removal and stockpiling of topsoil, inspection of the reclamation effort following construction of each flood control facility, and coordinating with agency personnel and construction supervisors.

Areas to be temporarily disturbed shall be minimized to the extent possible. These areas shall be clearly marked so that construction equipment and other vehicles are kept within their boundaries. Vehicle parking areas and construction staging areas shall be located on already disturbed sites to the extent possible.

Vegetation that can be avoided or salvaged shall be conspicuously flagged by the revegetation specialist. Salvageable vegetation may include Mojave yucca, Joshua trees, and cactus. We recommend that vegetation to be avoided include yucca, Federal candidate species, Bureau sensitive species, and creosote rings over 10 meters in diameter. Yucca and cactus specimens that can be removed and stockpiled for subsequent replanting should be handled using state-of-the-art techniques.

Wherever possible, in areas to be temporarily disturbed, vegetation shall be crushed or cut at ground level using a rotary mower rather than bladed. This will assist in reestablishment of species of desert shrubs, such as creosote bush, that are able to resprout from root crowns. Crushed and cut vegetation shall be chopped and stockpiled on the site for use following construction. The use of water to control dust on these sites is encouraged because it appears this may assist in maintenance of a live root crown and re-establishment of vegetation.

In areas to be permanently disturbed, the top 1 to 2 inches of topsoil, if present, shall be removed and stockpiled at the edge of the disturbed area. The topsoil shall be protected from wind erosion. The topsoil contains a seedbank of species from the area as well as organic matter, nutrients, and soil microorganisms important for plant re-establishment.

Following construction and removal of trash and equipment from the site, the soil surface shall be scarified with equipment that will not harm root crowns in order to partially reverse the effects of soil compaction from use of the site. A portion of the topsoil shall be spread over the temporarily disturbed area to a depth no greater than 1 cm. Studies have shown that seed emergence is highest with a 1 cm planting depth and slightly less at 2 cm, and it is therefore anticipated that only the seedbank in the top 2 cm. of soil is available for germination. Following spreading of topsoil, a final pass over the temporarily disturbed area shall be made by an imprinter or other similar equipment that will produce a slight pattern in the topsoil. These indentations are important to accumulating and retaining windblown seed on the site and improve the infiltration of surface water. We stress that maintenance of a rough soil surface is important, and the sites should not be smoothed with a blade. Salvaged plants should then be replanted. Joshua trees between 3 and 12 feet in height transplant well, and those that are under three feet generally do not. The stockpiled crushed and chopped vegetation shall then be spread on the site to assist further in trapping windblown seed and provide a continuing source of nutrients and organic matter.

We recommend that additional seeding be done if possible. Perennial shrub seed should be locally collected within the watershed and within a 30 mile radius of the area to be reseeded to ensure conformity to the local genotypes. Germination trials by scientists at University of California at Davis, Cooperative Extension, have shown that Mohavean desert shrubs with high germination rates include Yucca brevifolia, Ephedra sp., Hymenoclea salsola, and Grayia spinosa. Atriplex canescens has a moderate germination rate, whereas Ambrosia dumosa and Larrea tridentata have low germination rates. Seeding of herbaceous vegetation may also be appropriate, and seed of species to be used should also be collected locally. Indian rice grass (Oryzopsis hymenoides) may be helpful in reducing soil erosion.

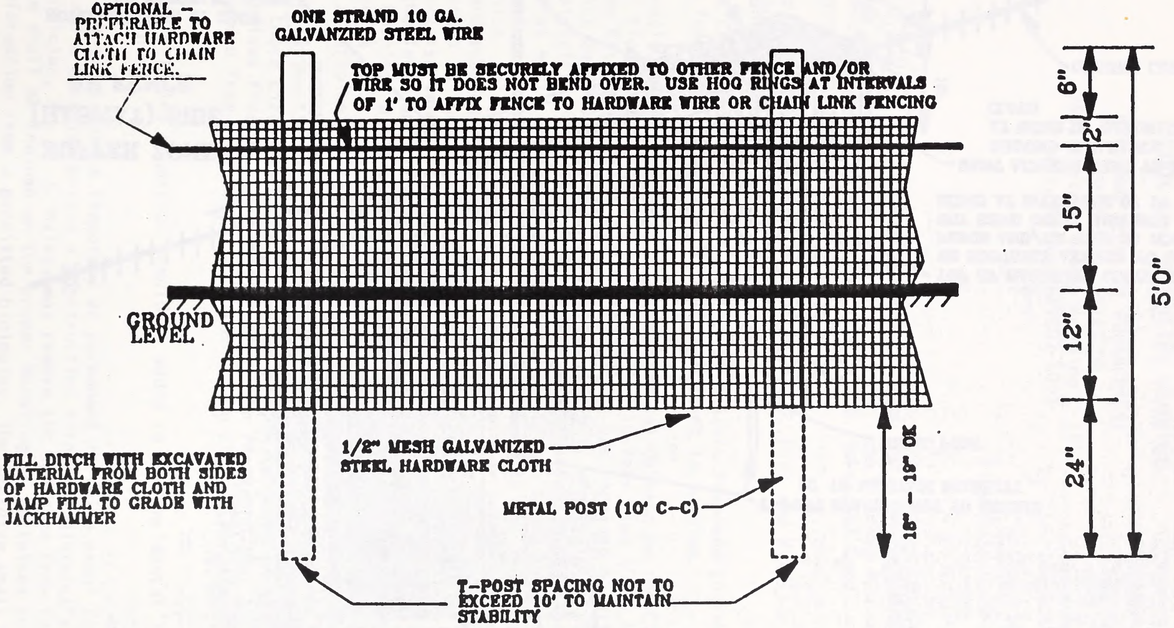
The use of mulch and fertilizer is not recommended because they tend to favor the establishment of non-native species. The use of non-native species or plants that are not indigenous to the area is not specified in this program because such species have less habitat value than native vegetation and may be detrimental to functioning of the ecosystem.

The temporarily disturbed sites shall be monitored every two years for a period of six years following the end of construction. A report shall be submitted to the Service following each two year monitoring period describing the success of the revegetation effort and an indication of which efforts have been the most successful. If at this time it appears that restoration is not proceeding in a successful manner, the District shall work with the Service to develop supplementary revegetation measures.

APPENDIX F

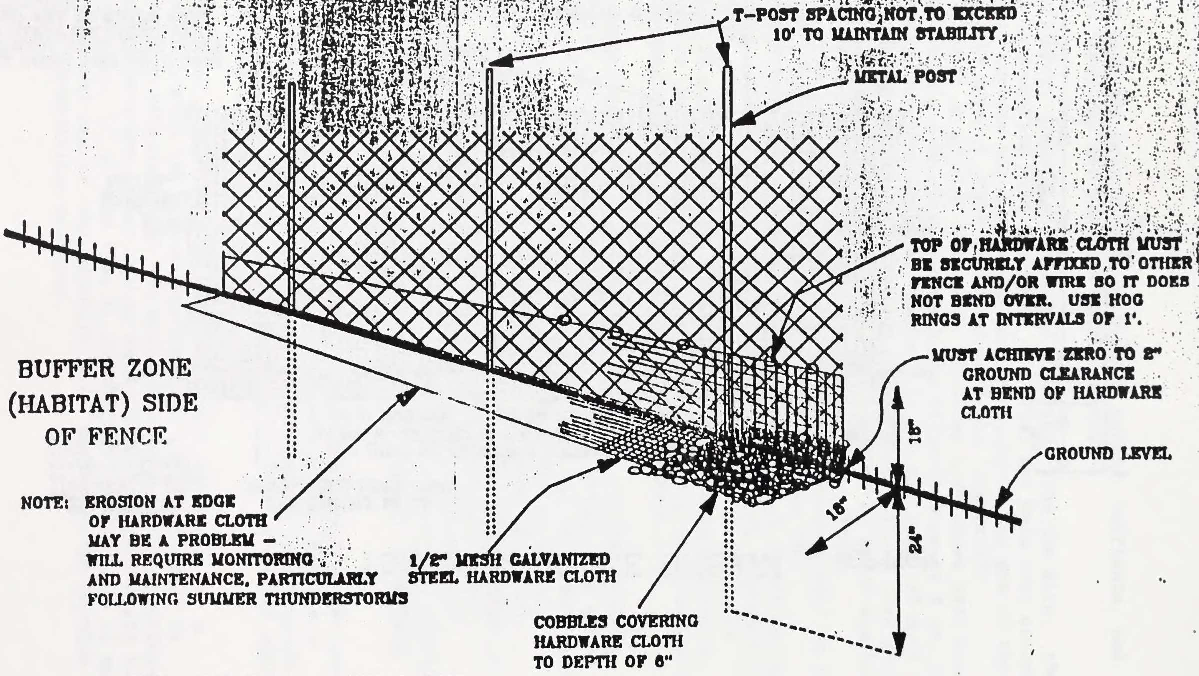
TORTOISE FENCE DESIGN

OPTION 1


OPTIONAL – PREFERABLE TO ATTACH HARDWARE CLOTH TO CHAIN LINK FENCE.
ONE STRAND 10 GA. GALVANZIED STEEL WIRE
TOP MUST BE SECURELY AFFIXED TO OTHER FENCE AND/OR WIRE SO IT DOES NOT BEND OVER. USE HOG RINGS AT INTERVALS OF 1' TO AFFIX FENCE TO HARDWARE WIRE OR CHAIN LINK FENCING
GROUND LEVEL
FILL DITCH WITH EXCAVATED MATERIAL FROM BOTH SIDES OF HARDWARE CLOTH AND TAMP FILL TO GRADE WITH JACKHAMMER
1/2" MESH GALVANIZED STEEL HARDWARE CLOTH
METAL POST (10' C–C)
T–POST SPACING NOT TO EXCEED 10' TO MAINTAIN STABILITY
18" – 19" OK
6"
2"
15"
12"
24"
5'0"

NOTE: GATES – CLEARANCE AT BASE SHOULD BE NO GREATER THAN 1".

TORTOISE FENCE DESIGN OPTION 2


T–POST SPACING NOT TO EXCEED 10' TO MAINTAIN STABILITY
METAL POST
TOP OF HARDWARE CLOTH MUST BE SECURELY AFFIXED TO OTHER FENCE AND/OR WIRE SO IT DOES NOT BEND OVER. USE HOG RINGS AT INTERVALS OF 1'.
MUST ACHIEVE ZERO TO 2" GROUND CLEARANCE AT BEND OF HARDWARE CLOTH
18"
GROUND LEVEL
16"
24"
BUFFER ZONE (HABITAT) SIDE OF FENCE
1/2" MESH GALVANIZED STEEL HARDWARE CLOTH
COBBLES COVERING HARDWARE CLOTH TO DEPTH OF 6"

NOTE: EROSION AT EDGE OF HARDWARE CLOTH MAY BE A PROBLEM – WILL REQUIRE MONITORING AND MAINTENANCE, PARTICULARLY FOLLOWING SUMMER THUNDERSTORMS

NOTE: THIS DRAWING IS NOT TO SCALE

March 3, 1849

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE ENHANCEMENT
RENO FIELD STATION
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

October 18, 1990
File No.: 1-5-90-F-25

MEMORANDUM 10/22/90

To: District Manager, Las Vegas District, U. S. Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Reno Field Station, U. S. Fish and Wildlife Service, Reno, Nevada

Subject: Clark County Regional Flood Control District's Proposed 10-Year Plan for Flood Control Facilities: Amendment to Opinion

This letter constitutes an amendment to the Biological Opinion on the Clark County Regional Flood Control District's (District) 10-Year Plan (File No.: 1-5-90-F-25). The Fish and Wildlife Service (Service) has received a letter from the District dated October 8, 1990 (copy enclosed), requesting that a member of the District's staff be permitted to handle tortoises under certain circumstances that would otherwise cause delays in construction, resulting in increased project expenses. The circumstances mentioned in the letter are instances in which, following installation of temporary or permanent tortoise-proof fencing and subsequent removal of tortoises from the site, tortoises somehow gain access to the site. This could occur through vandalism of the fence with a tortoise wandering into the area before corrective actions can be taken. Under the Terms and Conditions specified in the Incidental Take section of the Opinion, a biologist would normally not need to be present on a fenced construction site. Therefore, delays may occur while the construction crew waits for a tortoise biologist to arrive to move the tortoise to safety.

We are agreeable to the District staff member, Mr. A. J. Myles, handling tortoises under these circumstances provided he receive training on the proper handling of tortoises from a permitted biologist. We recommend that this training be received from a biologist with the Bureau of Land Management in Las Vegas.

Accordingly, the following condition should be added to the Incidental Take section of the Opinion.

1. 1. In the event that a temporary or permanent tortoise proof fence is compromised and a tortoise enters a construction site, the District's Engineering Technician, Mr. A. J. Myles, may remove the tortoise from the site. Mr. Myles shall be trained on the proper handling of tortoises and recording of information from a permitted biologist. The tortoise shall be transferred to a clean cardboard box and removed to a nearby shaded area according to the Desert Tortoise Handling and Overwintering Procedures provided in Appendix C of this Opinion. The biologist conducting tortoise

removal and marking activities for the project shall be notified immediately to come to the site to measure, weigh, tag, and relocate the tortoise. If the tortoise is one that was previously marked and relocated away from the construction area, as may occur with linear facilities that are temporarily fenced, Mr. Myles may relocate the tortoise according to Term and Condition 1.j. above. The situation which allowed the tortoise access to the construction site shall be corrected immediately. Mr. Myles shall record any information regarding the situation, including but not limited to any tag number on the tortoise, where the animal was found, where and how it was relocated, how it gained access to the construction site, and other pertinent data. This information shall be provided to the Service with other monitoring data as specified under Reporting Requirements given below.

The District has pointed out several omissions and inconsistencies in the Opinion. Accordingly, the following changes are made:

1. Page 18, paragraph 1.j., line 11, should reference Appendix C rather than Appendix A.
2. Table B-1 should include S24-85, 87, and 89.
3. Table B-1 should include H3-12 and 14.
4. Table B-2 should include H3-16. Facilities H3-12 and 14 should be removed from Table B-2.

If you have any questions, please contact Mary Jo Elpers at (702) 784-5227 or FTS 470-5227.

David L. Harlow

cc: Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon (AFWE-ES)
Senior Resident Agent, Division of Law Enforcement, Reno, Nevada
Special Agent, Division of Law Enforcement, Las Vegas, Nevada
Bureau of Land Management, Reno and Las Vegas, Nevada

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE ENHANCEMENT
RENO FIELD STATION
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

February 7, 1991
File No.: 1-5-90-F-25

NV54-90-216

Memorandum

To: District Manager, Las Vegas District, U. S. Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Reno Field Station, U. S. Fish and Wildlife Service, Reno, Nevada

Subject: Clark County Regional Flood Control District's Proposed 10-Year Plan for Flood Control Facilities: Amendment to Opinion

This letter constitutes an amendment to the August 29, 1990, Biological Opinion on the Clark County Regional Flood Control District's (District) 10-Year Plan (File No.: 1-5-90-F-25). The Fish and Wildlife Service (Service) has received verbal communication from Jeannie Cole of the Bureau of Land Management's Las Vegas District office on January 10, 1991, and copies of correspondence to your agency from the District dated November 26, 1990, and January 3, 1991, regarding changes in the design of the Upper Las Vegas Wash Detention Basin (Facility N3-8). In addition, that portion of the floodway (N3-1) extending north of the detention basin is proposed to be eliminated. Ms. Cole requested our determination of whether additional surveys would be required, and whether formal consultation with the Service should be reinitiated.

Our review of the alternative proposal indicates that the overall size of the new detention basin will be 5 acres less than that of the original facility. Furthermore, the area to be disturbed by the new proposed dike, located in the same general area as the floodway, is less than that of the portion of the floodway that will be eliminated by the alternative design. Therefore it is likely that the level of incidental take that would occur from construction of N3-8 Alt. would not exceed that which would occur from the original proposal.

Accordingly, the following condition is substituted for Condition 1.e. of the Biological Opinion issued to your agency on August 29, 1990. The change from the original condition is underlined.

1.e. Temporary tortoise proof fencing shall be erected around each of the following facilities prior to beginning construction activities: N3-8 Alt.; N4-8; N5-1, 2, 3, 4, 5, 6; N10-9, 10, 11; N12-9, 10, 11; C1-45; C2-46, 47, 48, 49, 52, 53; S1-59; S2-81; S4-23, 24; S20-17; S21-28, 29; S22-25; 4109-28. A qualified biologist shall supervise the erection of the fence. All tortoise burrows and other burrows and dens that could be occupied by tortoises within the fence construction zone shall be excavated by hand. All tortoises, including any eggs found, shall be removed from the fence construction zone according to the protocol provided in Appendix C prior to brush removal, grading, and fence installation.

If you have any questions, please contact Mary Jo Elpers at (702) 784-7227 or FTS 470-5227.

David L. Harlow

cc: Assistant Regional Director, Fish and Wildlife Enhancement,
Portland, Oregon (AFWE-ES)
Senior Resident Agent, Division of Law Enforcement, Reno, Nevada
Special Agent, Division of Law Enforcement, Las Vegas, Nevada
Bureau of Land Management, Reno and Las Vegas, Nevada
Clark County Regional Flood Control District, Las Vegas, Nevada

United States Department of the Interior

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE ENHANCEMENT
RENO FIELD STATION
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

February 15, 1991
File No.: 1-5-90-F-25

Memorandum

To: District Manager, Las Vegas District, U. S. Bureau of Land Management, Las Vegas, Nevada

From: Field Supervisor, Reno Field Station, U. S. Fish and Wildlife Service, Reno, Nevada

Subject: Modification of Four Facilities, Clark County Regional Flood Control District's Proposed 10-Year Plan for Flood Control Facilities

The U.S. Fish and Wildlife Service (Service) has reviewed your memorandum dated January 9, 1991, regarding modifications to four facilities proposed for development as part of the Clark County Regional Flood Control District's (District) 10-Year Plan. The four facilities are the Gowan Outfall, Angel Park Outlet and Buffalo Channel, Gowan Detention Basin South, and Upper Flamingo Detention Basin and Outfall Channel. The Service issued a Biological Opinion dated August 29, 1990, on the District's 10-Year Plan (File No.: 1-5-90-F-25). You requested our concurrence with your determination that reinitiation of Section 7 consultation would not be necessary.

Because the District's design modifications will result in changes in acreage of habitat disturbance and take of tortoises, an amendment to the Biological Opinion is required. Accordingly, this memorandum constitutes an amendment to the Biological Opinion for the District's 10-Year Plan.

The conclusions developed in this amendment are based on information provided in your January 9, 1991, memorandum, in a letter from the District to your agency dated October 1, 1990, in correspondence received by our office from the District dated January 24, 30 and 31, 1991, and on a series of telephone conversations between Mary Jo Elpers of my staff and Timothy Sutko, District hydrologist, during January and February of 1991.

Gowan Outfall

For the Gowan Outfall, facilities N1-2 and N1-3 have been changed by eliminating the original alignment and substituting a new alignment which is within a roadway. Facility N1-4 previously featured a right-of-way 30 feet in width. This right-of-way has been widened to 50 feet. We calculate that there will be 3.3 additional acres of habitat disturbance in an area of very low tortoise densities. We anticipate that no additional take of tortoises will occur from this modification.

Angel Park Outlet and Buffalo Channel

The Angel Park Outlet and Buffalo Channel facilities include three bridges, a detention basin outlet works, and three channels. Review of Figure A2-4 accompanying your letter indicates that facilities C2-47, 48, 49, 52, and 53 will be placed in slightly different locations than originally proposed. Facilities C2-48, 49, 52, and 53 will be shifted to the west. Although the right-of-way has been widened from 50 feet to 110 feet, this area is now highly disturbed. A new development, Desert Shores, is now located immediately to the west of C2-48 and C2-49, and the new alignment in this area is already separated from disturbed habitat to the west by a tortoise-proof fence. Other development or disturbed areas flank the remainder of the new alignment for its entire length on both sides.

No change is proposed for facilities C1-45 and C2-46. However, a portion of the C2-47 channel alignment has been moved from undisturbed habitat to Vegas Drive, a well established unpaved road approximately 60 feet in width. Habitat is disturbed and degraded beyond the roadway limit. Because the right-of-way has been moved from undisturbed habitat to an existing roadway, even though the right-of-way has been widened from 80 feet to 110 feet, no additional take of habitat will occur overall, nor do we anticipate any additional take of tortoises.

Gowan Detention Basin South

The changes proposed for the Gowan Detention Basin South involve increasing the right-of-way for a pipeline. This area is now developed, and no additional take of habitat or tortoises will occur with this modification.

Upper Flamingo Detention Basin

Proposed changes to the Upper Flamingo Detention Basin and Outfall Channel will result in increased take of tortoises and habitat. The information provided to us that was used in developing our August 29, 1990, Biological Opinion specified that flood storage at this facility would be developed over an area of approximately 50 acres (Clark County Regional Flood Control District. 1986. Flood Control Master Plan, Vol. 1, page 5-81). The Biological Assessment for the project, dated May 11, 1990, indicates that a total of 77 acres would be disturbed in construction of the detention basin. This latter figure included both temporary and permanent disturbance. The flood pool was included within the 77 acres of disturbance.

Information provided to us for the new design indicates that the area to be inundated in a 100-year flood event would total 89.2 acres. The total area of disturbance from construction, both temporary and permanent, equals 70.4 acres. Included in the area to be inundated are 47 acres which are to be excavated, with the remaining 23.4 acres for detention basin improvements and temporary disturbance. Thus the total acres of tortoise habitat to be affected by the proposed modification would be 112.6 acres. However, 42.2 acres would not be cleared of tortoises or vegetation, but would be affected by flooding during a 100-year storm event. Tortoise densities in this area were originally determined to be very high. District hydrologist, Timothy Sutko, indicated to us in a telephone conversation on February 13, 1991, that this area has become degraded by dumping of trash since the original surveys. No additional field work has been conducted to determine if the additional disturbance has resulted in a decline in tortoise densities in the area. In determining additional take of tortoises that would occur during a flood event, we based our calculations on the only information currently available, which are the surveys conducted by Dames and Moore, Inc. in September and October of 1989.

Table 1-M provides a summary of changes to Table 1 of the August 29, 1990, Biological Opinion, but only includes facilities addressed in this amendment.

Table 1-M. Impacts of 10-Year Plan facilities on the desert tortoise and its habitat

	Acres of Tortoise Habitat Disturbed		Relative Tort. Density	Anticipated Take	
	Original Design	Modified Design		Nests	Tort.
Gowan Road Detention Basin System				0	1
N1-2	1.2	0	Very low		
N1-3	3.2	0	Very low		
N1-4	1.6	4.9	Very low		
N1-6	0	0	Very low		
N1-7	0	0	Very low		
Angel Park/Gowan Detention Basin conveyance System				1	2
C1-45	0	0	Very low		
C2-46	0	0	Very low		
C2-47	6.8	6.8	Moderate		
C2-48	0	0	Very low		
C2-49	1.8	0	Very high		
C2-51	1.8	1.8	Very low		
C2-52	0.3	0.3	Very low		
C2-53	4.6	11.5	Moderate		
Gowan Detention Basin South				1	3
C3-55	242.0	242.0	Very low		
Upper Flamingo Detention Basin System				2	17
S1-59	77.0	112.6	Very high		
S2-61	4.6	8.0	Very low		

The incidental take section of the Opinion is amended as follows:

Incidental Take

7. Twenty-four (24) tortoises may be taken in the form of direct mortality through accidental death due to entrapment in facilities during major flood events during the life of the project.

9. 1,296 acres of tortoise habitat will be permanently destroyed and 364.1 acres temporarily degraded due to construction activities.

Terms and conditions

5. To implement reasonable and prudent measure #5, the following terms and conditions shall be implemented:

   a. To mitigate for the incidental take of habitat lost to construction, the District shall provide $324/acre of permanently lost habitat and $130/acre of temporarily disturbed habitat for a total of $467,885 (before adjustment for inflation). These monies shall be paid into a fund established through an interlocal agreement to be developed between the District and Clark County and shall be used for desert tortoise habitat acquisition and management (can include habitat acquisition, acquisition and retirement of grazing privileges, fencing, etc.) or implementation of any approved Habitat Conservation Plan developed by Clark County. None of these funds shall be used to develop the Habitat Conservation Plan, however. These funds are independent of any other fees collected by the County for desert tortoise conservation planning. These funds shall be held in an interest bearing account, and the accrued interest also shall be expended on desert tortoise conservation measures. Proposed expenditures shall be approved by the Service. One-half of the monies shall be paid prior to construction of the first facility; the remainder shall be paid either at the beginning of the following fiscal year or paid in yearly installments over a 1-year period with the amount adjusted for inflation. Should the funds not be expended on desert tortoise conservation measures approved by the Service within two years of their placement in the account established under the interlocal agreement for desert tortoise conservation, then these funds shall be transferred to The Nature Conservancy for such purposes.

We appreciate the cooperation we have received from the Bureau of Land Management and the District in preparing this amendment to the Biological Opinion. If you have any questions, please contact Mary Jo Elpers at (702) 784-5227 or FTS 470-5227.

David L. Harlow

cc: Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon (AFWE-ES)
Senior Resident Agent, Division of Law Enforcement, Reno, Nevada
Special Agent, Division of Law Enforcement, Las Vegas, Nevada
Bureau of Land Management, Reno and Las Vegas, Nevada
Clark County Regional Flood Control District, Las Vegas, Nevada

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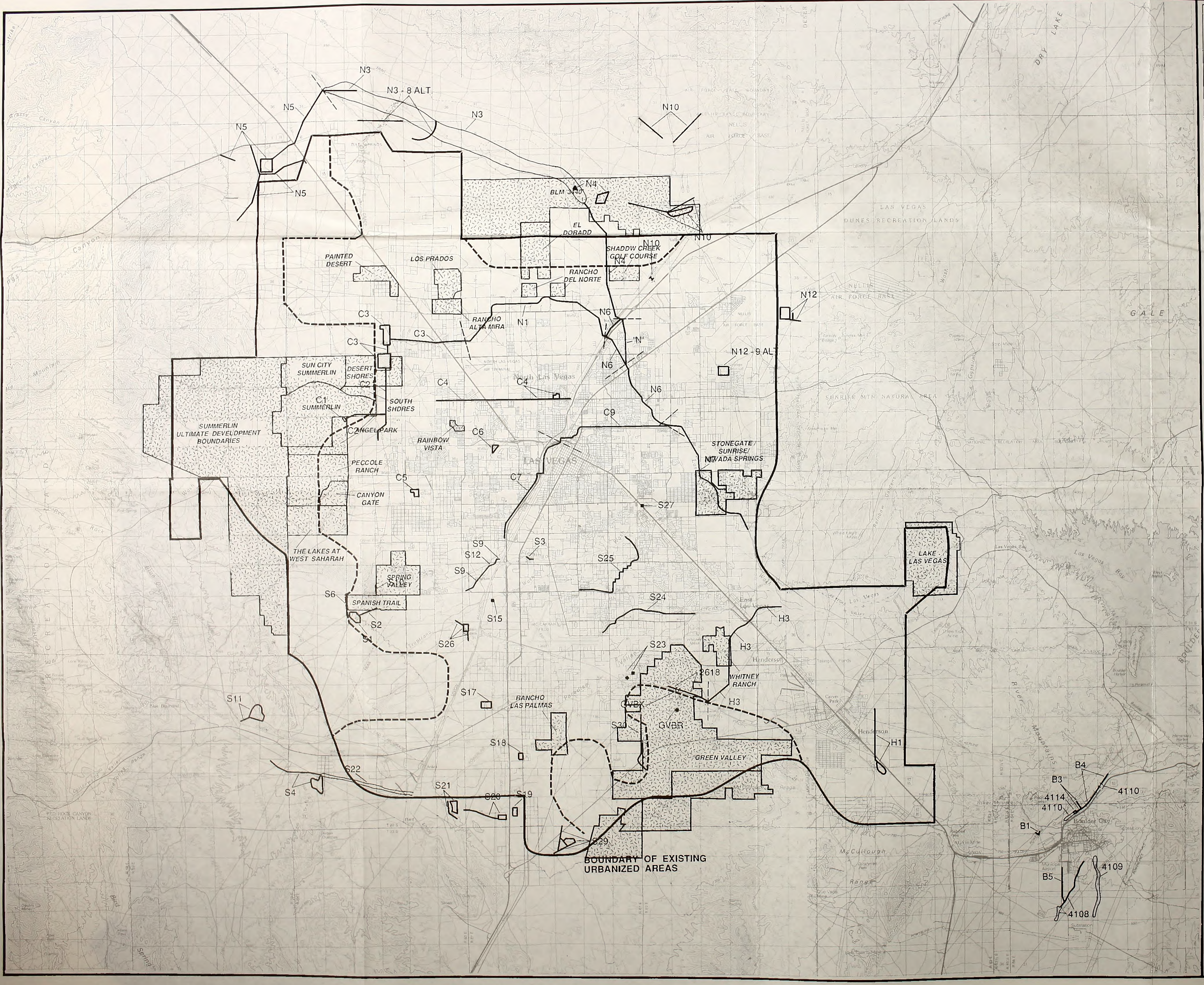
CURRENT AND
PROPOSED MASTER
PLANNED RESIDENTIAL
COMMUNITIES

FIGURE 13.1

DAMES & MOORE



CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT MASTER PLAN EIS 10-YEAR PLAN FACILITIES

0 10 15 20 30,000'

LEGEND

▨ CURRENT AND PROPOSED RESIDENTIAL COMMUNITIES (GREATER THAN 160 ACRES), 1990

- - - - - BOUNDARY OF EXISITNG URBANIZED AREA, 1990

——— MASTER PLAN ULTIMATE DEVELOPMENT BOUNDARY, 1986

— — — — STUDY AREA BOUNDARY

SEE TABLE 3-2 AND FIGURES 7-3 TO 7-16 FOR ADDITIONAL DETAILS

N5 FACILITY GROUP NUMBER

——— LINED CHANNEL, PIPELINE / BOX CONDUIT, OR DIKE / LEVEE

⊢⊣ CULVERT / BOX CULVERT

■ BRIDGE

⊐ DETENTION / RETENTION BASIN

⬭ WASH

— — — — STUDY AREA BOUNDARY

CURRENT AND PROPOSED MASTER PLANNED RESIDENTIAL COMMUNITIES

FIGURE 13-1

DAMES & MOORE

R'S CARD

OFFICE

DATE RETURNED

(Continued on reverse)

TC 530 C537 1991

Final environmental impact statement

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